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Familiar Science.

DESTROYERS OF CONTAGION.

MODERN science has let in a flood of light upon the cause of many illnesses, and the nature of the contagia upon which their propagation depends. Not only has the cause of disease been traced to agents external to the body, but the exact form of these disturbing organisms has been pointed out. They consist of minute solid particles, probably in most or all cases of a vegetable nature; they are therefore non-gaseous, and in no respect comport themselves like gaseous bodies.

The contagious principle of fever is a cork-screw-like spirilla; in other diseases it appears as a large motionless rod; in others as a solid body, ragged, and nearly round. These bodies float in the atmosphere in clouds, and when inhaled, or when they come in contact with abraded surfaces, inoculation occurs, and the disease is of the type peculiar to the nature of the specific poison. The bodies start in the circulation a morbid chemical action, or serve as a ferment, which disturbs or devitalizes the blood, and thus produces most serious illnesses.

Malarial fevers, measles, diphtheria, scarlet fever, small-pox, and many other alarming diseases result from blood poisoning through the action of these curious external agents. So long as the nature of the noxious material was unknown, the chemical agents, as disinfectants, deodorants, antiseptics, etc., were selected to satisfy the most various and dissimilar theories as to its nature and properties; but since a better understanding has been reached, a more intelligent and scientific selection and use of these substances can be made. It is important that in families where cases of zymotic diseases prevail, accurate knowledge should be possessed as to the methods of preventing a spread of the contagion. Every physician should be well informed on this subject, but unfortunately some of them are not.

Of course, the septic germs, in cases of small-pox, diphtheria, etc., fall upon the floors and walls of rooms, upon the bed, and upon the clothing of attendants. Upon these deposits the usual solid or liquid disinfectants exposed in the room have little or no effect; nothing but thorough cleansing and ventilation, with the use of *gaseous* disinfectants, will expel them. The best method to disinfect clothing is by the use of *heat*. Experiment has shown that no form of contagia can withstand a temperature of 220° F.; therefore, clothing placed in a hot box two hours, with dry heat above that of boiling water, is thoroughly disinfected; or it may be soaked in boiling water with the same results.

Vaccine matter may be taken as the type of a virulent material, and experiments upon this poison prove that disinfectants, to be effectual, must be used in much larger quantity than has usually been considered necessary. If the destroying agent is of an acid nature, the virus must be rendered permanently and strongly acid. The end desired is to destroy the infective power completely. It is not generally known that carbolic acid, in quantity equal to two per cent. of the virus, is incapable of doing this work upon vaccine virus. It deprives it of its infective power for the time being, but this returns as soon as the carbolic acid has escaped through exposure to the air.

Chlorine is a gaseous body, and is in ordinary cases an effective disinfectant. It is, however, inferior to sulphurous acid; this is the most valuable agent we have, but unfortunately it is not safe in inexperienced hands. A room in which a case of infectious disease has been placed can be thoroughly cleansed by burning a little sulphur in the absence of the inmates. The sulphurous acid is a gas exceedingly disagreeable and irrespirable, and great caution is necessary in its use.

Permanganate of potash is a true disinfectant, having oxidizing powers of high capability, but it must be used in much larger quantities than are usually employed. Its high cost is a bar to its free use, and it is not clearly seen how it can ever become much cheaper. Chloride of lime, *freely* used, is a good disinfectant; but when it is placed in vessels in small quantities in sick-rooms, or sparingly sprinkled in drains, it has but slight influence as a destroyer of contagion. Carbolate of lime is a cheap and good disinfectant, but it must be used in large amounts to be useful. Several of the metallic salts have powerful antiseptic properties; for example, the protosulphate of iron. This salt, in strong solution, is a valuable agent, and is worthy of notice. At this point it should be stated that carbolic acid and the metallic salts, used in small quantities, are *preservative* agents, and may actually prolong the life of contagium by preventing its destruction through natural processes.

There are numerous patented "antiseptics" and "disinfectants," which are perfectly worthless so far as any influence upon septic germs is concerned. It is very important that heads of families, and especially physicians, should clearly understand what is required when selecting an agent for practical use. Contagious particles of all forms are imbedded in an epithelial or albuminous covering, and they do not yield their vitality readily, and never to improper agents. There are good deodorants which arrest putrefaction and fermentation, and yet completely fail to destroy contagious particles.

NEW THINGS ABOUT OZONE.

NEARLY ten years ago — in February, 1871, to be exact — we gave in the JOURNAL an outline of the chemistry of ozone, and at intervals since that time we have had occasion to refer to new facts concerning this interesting substance. Our knowledge with regard to it has lately been increased by several curious discoveries, to which a few paragraphs may be appropriately devoted.

We may premise, for the benefit of those who were not readers of the JOURNAL ten years ago, and who may not otherwise have become acquainted with the chemical history of ozone, that it is a modification, or what is sometimes called an "allotropic form," of oxygen. It differs remarkably in its properties from ordinary oxygen, being far more energetic in its action. It attacks many metals and other substances which are not affected by oxygen. It is on account of this intenser energy that it is a powerful bleaching and disinfecting agent. Its specific gravity is one half greater than that of oxygen. It has also a peculiar odor, from which it gets its name, *ozone* being derived from the Greek ὄζειν (*ozein*), to smell.

As oxygen has been liquefied, we might expect that ozone (or, rather, the mixture of ozone and oxygen, for the former cannot be obtained pure) would be also reduced to the liquid state; and this has been accomplished by Troost and Hautefeuille. They first succeeded in preparing ozone in a more concentrated form than had previously been known. They obtained gas containing 60 per cent. of ozone; and interesting results are got by compressing this gas, or even oxygen with 20 per cent. of ozone, in Cailletet's apparatus for the liquefaction of gases. Sudden compression gives rise to very brilliant luminous phenomena. Much heat is liberated, the tube flies to pieces, and the ozone is converted into ordinary oxygen. If the compression is conducted slowly, the gas becomes violet-blue, the tint growing deeper and deeper. This is evidently the color of ozone, as other experiments, which we cannot describe here, also prove. When the ozone, after being subjected to a pressure of thirty-five atmospheres, is allowed to expand

suddenly, a blue mist appears, which consists of liquefied ozone. To reduce oxygen to the same condition a pressure of *three hundred* atmospheres is required.

The same investigators have found that the production of ozone in oxygen by the silent electric discharge in M. Berthelot's apparatus for that purpose is greatly influenced by temperature. If this be raised from 20° to 55° C. the proportion of ozone obtained is nearly quintupled. Increase of pressure has a like effect, but much less in amount for each temperature.

According to a German authority, ozone may be produced by the rapid evaporation of certain liquids. A few drops of ether or alcohol are let fall upon paper moistened with a solution of potassium iodide and starch (the ordinary test for the presence of ozone), and the volatile liquids set on fire. After their combustion the paper is found to be turned blue from the formation of ozone. This would make a simple and pretty experiment for school or lecture room.

SCRATCHING THE FACE OF MOTHER EARTH.

The material universe is built on a scale which our finite powers are absolutely incapable of comprehending. The immense spaces that separate the members of our own solar system tax our powers of conception to the utmost; and yet these are insignificant — almost infinitesimal — when compared with the distances between the sun and the fixed stars, its fellow suns, and the vaster intervals that divide this stellar system from others. The velocity of light in a second — nearly two hundred thousand miles — becomes too small a unit for measuring these grander stretches of space, and we have to use instead the distance its rays can fly in a year; but though we may use this enormous unit in our calculations, we cannot comprehend it, much less the multiples of it.

Even when we limit our thoughts to our own tiny planet, which bears a smaller proportion to the aggregate of worlds than a grain of sand does to its own bulk, we find it difficult to get a clear idea of its size, or of the relation between its dimensions and distances with which we are more familiar. When the child is told that the earth is "round like an orange," he is puzzled to understand how the ups and downs of the land about him can be portions of the surface of a sphere no rougher than an orange; but we should have to pick out a very smooth specimen of the fruit, or that comparison is a grossly exaggerated one. If we represent the earth by a school globe eight inches in diameter, the varnished surface, unless more nicely polished than is usual with such globes, is not smoother than the earth would seem to a hand big enough to handle it as we handle the pasteboard sphere. This is no loose statement, but a strictly mathematical one. If the globe is eight inches in diameter, — the earth being about eight thousand miles, — the "scale" of the former is a thousand miles to the inch. A mountain a mile high would then be represented by an elevation of a *thousandth of an inch*, and the highest mountains of the earth would rise only the *two hundredth* of an inch above the smooth surface. It is evident that such inequalities would not produce a greater roughening of the globe than we have supposed; while to represent the greater portion of the land surface of our world, the globe would need an almost glassy finish.

Of course the depths to which man has succeeded in penetrating the earth are like very fine scratches on our varnished globe. A recent writer, in order to give an idea of the vast scale of Western mining operations, used the following illustration: —

Imagine a shaft as tall as Bunker Hill Monument, and of the same proportion all the way up as at the base; dig a square hole in the ground just big enough to drop the monument in, and you have a perfect idea of a mining shaft. Then put fifteen monuments of that height each upon the other, and you have a fac-simile of one of the Comstock mining shafts. Down every fifty feet of this shaft are long tunnels running from it into the earth, each about as large as the shaft itself, through which the ore must be wheeled, and then raised to the surface by elevators.

Verily, great are the works of man, if we only compare them with other things he has done! But when we measure them by the grander scale of nature's works, when we take the diameter of the earth as our foot-rule in estimating them, how infinitesimal do the most stupendous of them become! And yet, as we have seen, the diameter of the earth is a unit too insignificant for any but the smaller measurements within the limits of our comparatively small solar system.

Even in estimating the scale of some of nature's operations, it is important to bear in mind how big this little earth really is. Here is a paragraph from a daily paper of this week: —

The Honolulu volcano, Mauna Loa, broke out November 5th, about six miles from the summit of the crater, throwing out two great streams of lava, one of which is 30 miles long, 100 to 200 yards wide, and about 20 feet deep. Terrible explosions accompany its flow.

That seems a mighty outburst; and when we visit Vesuvius, and see how its lava streams have at one time and another deluged large portions of the vicinity, burying villages and towns, we are amazed that such vast quantities of matter have been poured out from the mountain. But when we consider the magnitude of the earth, we see that the mischief done by the volcano, like the mountain itself, is absolutely insignificant. Vesuvius is at best but a minute pimple on the face of Mother Earth, and the "matter" it discharges is proportionately trifling. All the volcanoes in the world, if all active at once, would constitute but a trifling "eruption" on that gigantic visage. To animalculæ like ourselves, it seems as if her mighty frame must be shaken and convulsed, if, indeed, she be not sick nigh unto death; but in reality how slight and superficial is the disturbance, — scarcely skin-deep!

We intended to draw other suggestions from our subject, but must leave the reader to find them for himself.

EXERCISE AFTER SEDENTARY LABOR.

The *Lancet*, commenting on the death of Sir Alexander Cockburn, the immediate cause of which appears to have been a long walk on an excessively cold day after a judicial session, remarks: —

The judges are compelled to take muscular exercise when they can, and if they did not walk more than other men of their class, they would suffer the effects of sitting long hours in densely-crowded and ill-ventilated courts. . . . The lesson of the event may be a timely warning to the aged and energetic who "feel well" to avoid throwing too much work on organisms which must, in the nature of things, be weakly even when they seem strong. It is better to take the "constitutional" before the day's work than after it. The exercise a sedentary man takes immediately before his dinner should be comparatively gentle, and certainly moderate. When the mental and nervous parts of the frame are weary, or even exhausted, is not a time for work. Much harm results from the ill-founded hypothesis that we can rest one part of the body by working another. The organism is more closely knit together, and healthy work is more dependent on harmony of activity, than many seem to suppose. General sleep is made up of many minor forms of sleep, and healthful and safe exercise is scarcely possible when any part of the system is severely fatigued.

This is undoubtedly true if the exercise be violent or long continued, or if it be taken under unfavorable circumstances. In the case which furnishes a text for the *Lancet's* homily, a man of advanced age takes a long walk in *very cold weather*, after being confined for hours in the bad air of a London court-room, and it proves too much for him. If the walk had been shorter or the weather more comfortable, he might have found it refreshing and invigorating, as similar exercise had often been before. After long and wearisome sedentary labor we know of nothing more restful to body and mind than a quiet stroll in the open air. The gentle muscular exercise, the stimulating influences of the pure fresh air, the varied sights and sounds of outdoor life that divert our thoughts from the work on which we have been engaged, without taxing or tiring them anew, — all do us good like a medicine; or rather they are like wholesome and nutritious food that gives us strength for fresh labor. It is not necessary, as many suppose, that exercise under such circumstances should be either protracted or severe. On the contrary, as the writer in the *Lancet* intimates, this may make it an injury instead of a benefit. It should be a recreation rather than an exertion, if we would have it prove a re-creation indeed, a renewal and not an exhaustion of vigor. There are times when we want muscular exercise for its own sake, when we may take long and rapid walks or tire ourselves in other kinds of bodily activity, but not when we are already worn out with sedentary or mental labor. The distinction is an important one, but it is liable to be overlooked.

SIR JOHN LUBBOCK ON ANTS.

Sir John Lubbock has been continuing his investigations of the habits of ants, and reports the results in *Nature*. They show that ants are in some respects very much "like other people." One of their characteristics is a decided dislike to any change in their government. If the queen-ant is removed from a nest, the tiny politicians settle down soon into a steady-going republic, as they are of course bound to do for lack of any recognized ruler; but after they have got accustomed to this new form of government, if a queen-ant is introduced, the whole community sets upon the intruder and pulls her to pieces. This shows that custom is as potent among ants as among their human superiors. However, Sir

John Lubbock was not willing to allow his well-meant endeavors to turn a republic into a limited monarchy to be thus thwarted; so he selected at first a few ants to be the body-guard of the queen, then gradually a few more, until at last a respectable phalanx of devoted servants were gathered round her majesty. After this, she was introduced into the nest, along with her retinue, and the result proved satisfactory. "I was enabled," says Sir John Lubbock, with parlonable pride, "to secure her the throne." Another thing that shows a strong resemblance to men is the reluctance of the ants to believe travellers' tales. Sir John found that in every instance the volunteers who went to assist a comrade, who had brought back news of a great "find" of fresh meat, journeyed very leisurely, and were always outstripped by their enthusiastic pioneer, who had actually seen the treasure. As soon as they caught sight of the blue-bottle, or whatever it might be, all was changed: the greatest activity was instantly shown, and the corpse was speedily dismembered; thus showing that the maxim that "seeing is believing" holds good in the ant as well as in the human kingdom.

NITROGEN.

Whence came the great ocean of nitrogen in which we live, and what is its mission on earth? Were all the nitrogen in our atmosphere to settle down upon the surface of the earth, it would form an ocean over four miles deep, above which would project a few of our highest mountains, like islands from the sea. Estimating the surface of our globe at two hundred thousand square miles, we have a great reservoir representing eight hundred thousand cubic miles of nitrogen. Has this great quantity of inert gas been present in the atmosphere from the beginning? we would ask. Science tells us that our little ball of solid earth was once a molten mass, the temperature of which we can scarcely estimate. Chemical research proves that no compound is able to endure a very high temperature without suffering dissociation. Hence we may suppose that there has been a time when the elements which enter into the crust of the earth were in a free state, uncombined with each other. The protuberances observed darting out from the chromosphere of the sun consist of hydrogen gas, and show that this element exists there in a free state. When our earth was at a white heat, free hydrogen existed in its atmosphere likewise, while now it can rarely be detected there. In the general marriage of the elements, the insatiable oxygen was successful in wooing the refractory carbon, silicon, and most of the other elements. Nitrogen, an indifferent coquette, refused his advances, and still remains, for the greater part, in single blessedness.

Various reasons have been given for the presence of such a large proportion of nitrogen in the air. The older books tell us that its principal use is to dilute the oxygen and prevent its burning up everything, and also to fit it for the respiration of man. Yet the researches of competent physiologists, like Müller and Regnault, have proved that the present composition of the atmosphere is not the only one favorable to normal respiration. The percentage of oxygen is about 21, whereas 15 per cent. of oxygen is amply sufficient to sustain life. On the other hand, the quantity of oxygen might be very largely increased without injury to life. If a diluent were necessary, hydrogen could have been employed in place of nitrogen, without detriment to animal life. Instead of assuming that the atmosphere was made up especially to suit our individual wants, would it not involve less conceit upon our part to admit that animal life is conditioned by the state of the atmosphere; that life first appeared upon the earth when, by natural causes, the atmosphere had reached a state favorable to its support, — just as life will cease when these conditions are so far changed as to render life impossible?

Having sought to explain the presence of nitrogen in the atmosphere, we come next to the questions of its mission there, and whether the amount is gradually decreasing or the reverse. Nitrogen is an essential constituent of every being that lives and moves upon the surface of the earth, that swims in the sea or floats in the air above. Not a germ, not a spore, not even the animalculæ and the fungi, are able to exist without nitrogen. In short, we may exclaim, "Without nitrogen no life!" Every experiment upon spontaneous generation involves the use of nitrogenous liquids. A large quantity of nitrogen enters into the composition of the animal, yet it is not supposed that any of it is absorbed directly from the atmosphere. It is true that nitrogen is absorbed by the blood in greater quantities than by pure water; yet the quantity respired from the lungs differs so little from that taken in during an inspiration, that it probably plays no other part in respiration than to wash out the carbonic acid brought to the lungs by the venous blood. Hydrogen would answer as well for this purpose. Whence, then, does the animal obtain its supply of nitrogen? Evidently not through the lungs, but by means of the stomach, from articles of food and drink; in other words, we get our nitrogen from plants, in some of which it is present in considerable quantity. The plant alone seems to possess the power of building up, out of mineral substances, those complex organic compounds which are suited for the food of man and animals. The nutritive value of a given article of food depends principally upon the quantity of nitrogen it contains in a form ready for assimilation. Gluten, vegetable albumen, and caseine are some of the proximate principles formed in the plant and prepared for the use of the animal kingdom. The broad assertion has been made that non-nitrogenous food contains no nutriment, because it is unable to contribute to the formation of blood or flesh.

The plant possesses the power of absorbing nitrogenous compounds of very simple structure (such as ammonia and nitric acid), of assimilating their nitrogen, and building up from them bodies of the most complex structure, such as albuminoids. The free nitrogen of the air is of no more avail to the plant than to the animal; the plant must obtain it from other sources, which are usually found in decaying vegetable and animal matter, particularly the latter. The agriculturist recognizes the necessity of furnishing the growing plant with nitrogen. This is accomplished by the use of manures which contain decomposing animal matter, or fertilizers containing ammonia or nitrates. The ammonia for this purpose is either obtained as a by-product in making gas from coal, or is applied in the form of guano. In either case the origin of the ammonia has been organic life. If nitrates are employed, such as nitre and saltpetre, which are found in great quantities in some parts of the world, it is probable that they have resulted from the oxidation of ammonia, which in turn is the product of putrefying animal and vegetable matter. So seldom is ammonia or nitric acid found under conditions that lead us to doubt of their organic origin that it would seem almost as if plants and animals were quite independent of the atmospheric nitrogen. We may say that there are two totally distinct stores of nitrogen, — the one existing free, the other in combination: the latter travelling around a closed circle from the soil to the plant, thence to the animal; from the animal out into the atmosphere, not in a free state but as ammonia, to be carried back to earth with the next gentle rain, or to be oxidized and dissolved as a nitrate, and finally to reach the plant in its second cycle.

The problem of how the first plant obtained its nitrogen, and whether nitrogen is being slowly removed from the atmosphere to be stored up in compounds, is not easily solved. Oxygen and nitrogen will combine under the influence of an electric spark. After a thunder shower, nitric acid has been detected in the air. Possibly some nitrogen is thus rendered available for plant life, and slowly but surely the great store of nitrogen is being drawn upon, and insensibly diminished. That it will ever be consumed seems unlikely, for plant life will have ceased upon the earth, for the want of carbonic acid, before the supply of nitrogen has perceptibly diminished. H.

SCIENTIFIC BREVITIES.

Transforming Sound into Light. — M. Trève has described to the French Academy of Sciences an experiment with an apparatus which he calls a singing condenser, by which he believes he effects the transformation of sound into light. When a current of electricity is brought to bear upon his condenser a sound is produced, which he attributes to the vibrations of the air in the condenser, produced by the shock of the electric current. Reversing this experiment, he placed the condenser in a Geissler tube, and brought the two poles of the electric current to bear upon the condenser through the electrodes of the table. The tube was then connected with an air-pump. The condenser sounded as usual when the current was directed to it under the ordinary atmospheric pressure; but when the air was withdrawn the sound became more and more feeble, until, as a vacuum was produced, it ceased entirely, and a clear, bright light appeared, sparkling like pearls, from the leaves of the condenser, — quite unlike the ordinary pale, vague light of the Geissler tubes.

Electricity and the Growth of Bamboos. — In bamboos the flow of sap takes place at the beginning of the rainy season, but vigorous shoots rarely grow before the thunder-storms, which generally precede the harvest. The rapidity of their growth increases with the violence of the storm, amounting sometimes to as much as seventy feet in thirty days, the vegetation being most active during the night. Captain Sleeman suggests that the cause of this sudden growth may be the increase in the quantity of nitrogenous compounds, which are greedily absorbed by the humus that surrounds the roots of the bamboos.

Equine Endurance. — Some experiments have been made in Paris with a view to determining the capacity of the horse to undergo the privations incident to a state of siege. They showed: (1.) That a horse may hold out for twenty-five days without any solid nourishment, provided it is supplied with sufficient good drinking-water. (2.) That a horse can subsist for barely five days without water. (3.) If a horse is well fed for ten days, but insufficiently provided with water throughout this period, it will not outlive the eleventh day. One horse, from which water had been entirely withheld for three days, drank on the fourth day sixty liters (fifteen gallons) within three minutes. A horse which had received no solid nourishment for twelve days was nevertheless in a condition on the twelfth day of its fast to draw a load of 279 kilograms (625 pounds).

Preservation of the Colors of Dried Plants. — The *Journal de Pharmacie* states that this is most effectually done by passing the plant slowly through a solution of one part of salicilic acid in six hundred parts of alcohol, heated to boiling point in an evaporating vessel. The superfluous liquid is then to be shaken off, and the plant placed between blotting-paper and pressed as usual. The blotting-paper must be frequently renewed, espe-

cially at first. Plants so treated dry rapidly, and preserve their natural colors more perfectly than under any other procedure.

HINTS FOR EXPERIMENTS.

Decomposition of Carbonic Acid by Magnesium. — Upon plunging a fine burning wire of magnesium into a large glass cylinder filled with carbonic acid, the metal continues to burn with a brilliant white light, and to throw out brilliant sparks in all directions. Carbon is soon deposited upon the walls of the cylinder, while the heavier magnesia falls to the bottom of the vessel. The phenomenon forms a very interesting lecture experiment.

A Phenomenon of Elasticity. — If elastic gum is warmed, then expanded and wound in a spiral upon a glass tube or wire, and placed for a short time in a cooling mixture, it shows no tendency to contract; but when it is immersed in hot water it returns quickly to its original length. This phenomenon can also be noticed without the use of the cooling mixture. If one holds heated gum a second in an expanded condition it shows no disposition to return to its original length; but if one immerses it in hot water it contracts to one fourth or one fifth, and remains contracted to the third or fourth of its original length. Maxwell found similar phenomena in gutta-percha, when this was subjected to expanding influences while in a cool condition. These are very marked phenomena of the secondary effects of elasticity.

HOUSEHOLD RECIPES.

Cleaning White Lace. — A German industrial paper gives the following processes: —

White silk lace is to be sewed over small, clean slips of wood to keep it evenly spread out; laid over night in warm milk, to which a little soap has been added; rinsed in fresh water, laid for the same length of time in warm soap-lye, and finally rinsed without any friction. If a supplemental bleaching is still necessary, put the lace, while still damp, in the rays of the sun.

Linen lace is best cleaned by covering the outside of a large glass bottle smoothly with stout linen or white flannel, upon which the lace is sewed in a number of coils, and over the whole some coarse open tissue is secured. The bottle thus dressed is allowed to soak for a time in lukewarm soft water, and the outside wrapping is then rubbed with soap and a piece of flannel. After this process the bottle is laid to steep for some hours in clean soft water. It is then rolled between dry towels, dipped in rice-water and rolled again. Finally, the damp lace is unfastened from the bottle and ironed at once between linen cloths.

For Curing Meat. — The *Germantown Telegraph* gives the following as a well-tested and highly commended recipe for curing beef, pork, mutton, hams, etc.: To one gallon of water take 1½ lbs. of salt, ½ lb. of sugar, ½ oz. saltpetre, ½ oz. potash. In this ratio the pickle can be increased to any quantity desired. Let these be boiled together until all the dirt from the sugar rises to the top and is skimmed off. Then turn it into a tub to cool, and when cold pour it over your beef or pork. The meat must be well covered with pickle, and should not be put down for at least two days after killing, during which time it should be slightly sprinkled with powdered saltpetre, which removes all the surface blood, etc., leaving the meat fresh and clean. Some omit boiling the pickle, and find it to answer well, though the operation of boiling purifies the pickle by throwing off the dirt always to be found in salt and sugar. If this receipt is strictly followed, it will require only a single trial to prove its superiority over the common way, or most ways, of putting down meat, and will not soon be abandoned for any other. The meat is unsurpassed for sweetness, delicacy, and freshness of color. Omit the potash unless you can get the pure article. Druggists usually keep it.

Practical Chemistry and the Arts.

THE STEAM POWER OF THE WORLD.

Mr. Ruskin, in a recent characteristic letter refusing an invitation to go to Chesterfield to attend an art exhibition, asks if the town is not "the home, the cradle, of that arch-abomination creator, Stephenson," to whom "we are indebted for the screeching and howling and shrieking fiends, fit only for a Pandemonium, called locomotives, that disfigure the loveliest spots of God's own land." But the iron horse is a good creature, in spite of Ruskin's denunciations, and not unpoetical withal to those who can look at the triumphs of modern science from the right point of view. Whence does the mighty machine derive its energy? From the sun, the great source of mechanical power. The ancient conception of the chariot of Phœbus, with its fiery steeds, which none but their divine master could guide, — as the rash Phaëthon learned by fatal experience, — was eminently poetical and beautiful; but the locomotive is in very truth one of the horses of the sun. Its strength and speed are born of the sunbeams that fostered the vegetable growth of an epoch long before the creation of man. The actinic force of the sunbeams, stored up in those ancient plants until they were converted into coal, is awakened from its sleep of ages in the form of heat, and furnishes the motive power of Mr. Ruskin's "shrieking fiend." But the fiends are the "sons of darkness," while this, as we have seen, is the offspring of the sun, — an "angel of light" rather than of darkness.

But we took our pen not to illustrate "the poetry of science," but to record certain plain, dry facts concerning the steam power of the world, lately published by a German statistician. According to him, four fifths of the steam-engines now at work have been made within a quarter of a century or so. Of locomotives in the Old and the New World there are more than a hundred thousand, — verily, a fearful army of demons, if Ruskin were right! Their total force is equal to thirty million horse-power, and all the other steam-engines on the globe are estimated at forty-six million horse-power. But the technical "horse-power" is really equal to three average horses, and each horse to about seven men. The aggregate power of all the engines is therefore vastly more than the effective force of all the human workers living. The steam vessels of the world are estimated to be about fourteen thousand in number, with a tonnage of nearly five million tons.

INDUSTRIAL AND LABORATORY NOTES.

The Suez Canal. — The discussion of the Panama Canal project has awakened a general interest in the Suez Canal, and the readers of the Journal may like to know that the total tonnage that has passed through the latter in the ten years, 1870–79, is according to official statistics about 23 million tons, giving an annual average of 2,310,000 tons. In 1879 it was 3,236,800 tons, and it had previously reached a maximum of 3,418,900 tons in 1877, which is about eight times the initial figure, 438,900 tons. The number of vessels that have passed through increased from 485 in 1870 to 1477 in 1879. This is a less rapid increase than that of the tonnage, indicating that larger kinds of ships have come to pass through. The English flag covers more than three fourths of the tonnage (exactly 76 per cent.). France, which comes next, has only a twelfth, while at first she had a fifth. The Dutch and Italian flags, which at first appeared little in the canal, have together obtained equal importance with the French since 1875. The gross receipts from the canal rose from some 9 million francs in 1870 to 34 millions in 1877, and they were 31 millions last year. The maintenance of the canal proves easy; it requires, on an average, a yearly dredging of 950,000 cubic metres, which is effected with economical and powerful engines. The average time occupied by British troop-ships in the canal in 1878 was about 40 hours (17 hours' passage), calculated from 49 voyages.

An Electric Rock-Borer. — Messrs. Siemens and Halske have devised an electric hammer or rock-boring tool. A rod of steel-headed soft iron moves through three coils of insulated wire; the central coil is traversed by a constant current, which magnetizes the rod, and the other coils are traversed by alternating currents, so they "attract and repel" the rod with rapid movements.

Paper for Inerasible Writing. — By a new process patented in England, paper for bank checks, etc., is dipped in an aqueous solution of sulphate of copper and carbonate of ammonia, and then dried, after which it is dipped in an alkaline solution of cochineal or other coloring matter. The ink to be used consists of 3 oz. bichromate of potash, 3 oz. copperas, 4 oz. oxalic acid, 1 oz. red prussiate of potash, 3 oz. extract of logwood, 2 oz. glycerine, and a suitable quantity of any convenient red, blue, or other pigment.

A French Fire-Resisting Preparation. — The French Society for the Encouragement of National Industry has lately awarded a sum of 1000 francs to M. Martin, of Paris, for his preparations, which have been variously tested by a committee of the society. The report briefly is that M. Martin's mixtures render tissues and the superficial parts of wood uninflammable, that they do not alter the tissues nor the colors, and that stuffs so rendered uninflammable retain this property after having been exposed several months, either in a stove at 36° C. or on the stage of a theatre. M. Martin's mixtures are not in a sense new. For all light tissues he uses pure sulphate of ammonia (8 parts), carbonate of ammonia (2.5), boric acid (3), pure borax (2), starch (2), water (100). Another mixture applied to painted decorations consists of muriate of ammonia, boric-acid, glue, gelatine, water, and lime. Two other preparations are specified. M. Martin's preparations are said to have been used with success for decorations in several theatres in Paris, and in the play of La Venus Noire, for rendering uninflammable the masts of vessels in which a fire is simulated every night by means of oakum wrapped round the masts.

Testing Pickles for Copper. — The *Journal of the American Chemical Society* states that Mr. Edwin Hawley has analyzed fifteen samples of grocers' pickles for copper and other poisonous metals. They were obtained in Michigan, except two samples, which were furnished by Chicago dealers. Only one sample was found to contain copper, and this was in an enormous amount. From 5.909 grammes of pickle (drained, but not dried), the weight of cuprous sulphide was 0.0755 gramme. This gives over four per cent. (4.58 per cent.) of crystallized copper sulphate in the pickle. The pickles of this sample left a decided copper deposit upon a bright knife, upon a few minutes' contact. In the examination, the pickle was dried,

and ignited in a porcelain crucible, with addition of sulphuric acid. The residue was treated with dilute nitric acid and water, and the resulting solution charged with hydrosulphuric acid gas. Negative results showed absence of lead, etc., as well as copper.

A New Copying Apparatus. — A recent English patent is for a means of producing copies of written matter in black instead of colored inks, as heretofore. The apparatus consists of a pad, copying ink, and an inking roller. The writing is executed on paper with copying ink of an aluminous solution, and left to dry without blotting; it is then placed face downwards on the pad, and evenly rubbed for about three minutes. The paper being removed, a negative is left on the pad; printing ink is then applied by a roller to the negative, and the superfluous ink washed carefully off. Copies can be taken from the negative in a similar manner to that adopted in lithography, but without any mechanical pressure.

Steel and Gas. — M. Aube has patented in France a method of converting iron into steel, and at the same time producing illuminating gas. Iron is placed in a retort with charcoal or coke in layers, and heated to 900° C.; fatty matters are then injected, and as soon as decomposition has taken place, a jet of dry steam is passed over the incandescent mass. The result is said to be that the iron is converted into steel, and carburetted hydrogen is given off from the retort.

PRACTICAL RECIPES.

Aqueous Varnish and Starch Gloss. — Dr. Geissler, according to *New Remedies*, gives the following recipe for such a varnish: "It is most simply and rapidly prepared by shaking a saturated solution of borax with powdered shellac *without* heat. One part of shellac is soluble in two parts of a saturated solution of borax, after frequent shaking during two or three days. In three parts, however, it is easily soluble. The *bleached shellac* must be preserved *under water*, and must be dissolved *immediately after being* powdered; for, if it is allowed to be exposed to the air, in a powdered condition, for several days, it will either not dissolve at all, or only with great difficulty. If a higher temperature than 50° or 60° C. is used in preparing the varnish, it is apt to assume a faint reddish color, the cause of which I have vainly tried to ascertain. The finished varnish, however, bears heat very well. Now this varnish may not only be used for rendering pictures, maps, prints, etc., *glossy*, but it is a *most excellent starch-gloss*, and its preparation would therefore be also remunerative for many pharmacists. In fact, this varnish is much more appropriate and serviceable for this purpose than all other known commercial 'starch-glosses.'"

Ink for Laboratory Use. — A German pharmaceutical magazine gives the following recipe for a fine black ink, which flows easily from the pen, and may be used in laboratories, drug stores, etc., for labelling objects which are liable to get wet, or for producing writing which will resist acids and caustic liquids: 20 grams of brown shellac are dissolved in a warm solution of 30 grams of borax in 300 to 400 grams of water, and filtered hot; to the filtrate is added a solution containing 7.5 to 10 grams of water-soluble nigrosin, 0.3 gram tannin, 0.1 gram picric acid, 15 grams water of ammonia, and 7 grams water.

To Fasten Cloth on Wooden Surfaces. — The following is a German process for fastening cloth to the top of tables, desks, etc.: Make a mixture of 2¼ pounds of wheat flour, 2 tablespoonfuls of powdered rosin, and 2 tablespoonfuls of powdered alum; rub the mixture in a suitable vessel, with water, to a uniform smooth paste; transfer this to a small kettle over a fire, and stir until the paste is perfectly homogeneous, without lumps. As soon as the mass has become so stiff that the stirrer remains upright in it, transfer it to another vessel and cover it up, so that no skin may form on its surface. This paste is applied in a very thin layer to the surface of the table; the cloth, etc., is then laid and pressed upon it, and smoothed with a roller. The ends are cut off after drying. If leather is to be fastened on, this must first be wetted. The paste is then applied, and the leather rubbed smooth with a cloth.

Paraffine as a Wood Preserver. — A German scientist recommends paraffine as an efficient means of protecting wood against damp, acids, and alkalies. The wood is first well dried, and then covered with a solution of one part melted paraffine in six parts petroleum, ether, or bisulphide of carbon. The solvents evaporate quickly, leaving the paraffine in the pores of the wood. Great care must be taken in the use of this preparation, since paraffine, as well as petroleum, ether, or bisulphide of carbon, is very inflammable; and even the vapor of the last two mentioned substances, if mixed with air, may give rise to dangerous explosions. Paraffine melted, with equal parts of linseed oil and rapeseed oil, is also very useful to protect iron from rust.

Acid-Proof Cement. — How to make paste or cementing material that is proof against acid fumes — like those given off in the preparation of silver nitrate, for instance — is well worth knowing. Finely-powdered glass, mixed with soluble silicate of soda, will give a material of this description.

Agriculture.

APPLES AS FOOD FOR ANIMALS.

The enormous crop of apples the past season has awakened much inquiry with regard to their food value for animals, — cows, pigs, horses, etc., — and many statements have been made in the papers which are erroneous, and calculated to lead farmers and others astray upon the subject. We could not find at hand any reliable analysis of the fruit, of the varieties such as are raised largely in our Northern States, and this circumstance determined us to make analysis of several prominent kinds, as the Tolman's Sweets, Hubbardston Nonesuch, and Baldwins. The apples selected were in different stages of ripeness, the Hubbardstons being more advanced than the others. Very important modifications are produced by the chemical changes in apples as they approach the stage of maturity, or the period when they become mellow and ready for the table. The amount of sugar increases, and the hydrated malic acid decreases, or disappears altogether in some fruits. The cell walls of the structure become softened, and readily break down; oxidation or decay begins at any point where imperfections or abrasions in the skin occur. The amount of nutritive material is to some extent increased in ripe apples, and they are much more easily digested and assimilated by men and animals.

The results of the analysis were as follows: —

Hubbardstons.	
Water	88.57
Albuminoids, pectose gum, and sugar	11.27
Ash	0.16
	100.00

Tolman's Sweets.	
Water	83.29
Albuminoids, sugar, pectose gum, etc.	16.54
Ash	0.17
	100.00

The unripe Baldwins gave 87 per cent. water, with a less amount of albuminoids and sugar than the others, and considerable free hydrated malic acid. The sugar varied from about 5 per cent. in the Baldwins to 9 per cent. in the Sweets. The total insoluble matters, including skin, seeds, pectine, ash, etc., averaged about 3.25 per cent.

These results show how largely preponderating in apples is the water, which in amount is about 85 per cent. of their weight. Therefore, a tree bearing 30 bushels (46 pounds to the bushel) holds up in the fruit about *half a ton* of water. The nutritive value of apples is of course not in the water, but in the solids, — albuminoids, sugar, and gum. In a bushel of Hubbardstons there is about six pounds of soluble nutritive material at the period of ripening; in Tolman's Sweets, about seven pounds; in Baldwins, five pounds; and this material will vary to a considerable extent in value. Sugar is a carbonaceous substance, and nutritive in a certain direction. It is mainly useful as fuel, and by oxidation serves to maintain animal warmth. The albuminoids are nitrogenous, and therefore are foods proper; the gum is also a food.

We may conclude from these investigations that apples of the varieties best known have a positive food value, but it is small. The albuminoids are seldom found above half of one per cent. in any varieties, and this would give us less than four ounces in the bushel; of sugar we find in a bushel about two and a half pounds in acid fruits, and considerably more in sweets. This exhibit shows that the statements made by some farmers that they are able to obtain a pound of butter from feeding a bushel of apples is not true. A full consideration of this important matter demands more space than we have to spare at present, and the topic will be continued in the next number.

MASSACHUSETTS STATE BOARD OF AGRICULTURE.

The country meeting of the State Board, at Southboro, in December, was one of great interest and profit. The attendance was large, and the character of the papers presented was of unusual value. It was a great disappointment to be unavoidably prevented from attendance. We were under engagement to lecture upon the "Chemistry of the Farm House," on Tuesday evening, December 1st, but a sudden attack of illness kept us at home. We hope to be able to have the address ready to publish in the forthcoming report of the secretary. The exhibition of corn at the meeting was very large, and the specimens were fine. There is manifestly a growing interest in this magnificent crop, and the influence of the Journal has aided in no small degree in creating this interest. It is now known to be a profitable crop; perhaps, taking all things into account, the most profitable in New England. The new secretary of the Board, Mr. Russell, is very efficient in his duties, and the success of the meeting is due in a large degree to his efforts.

CHEMISTRY AND ACORNS.

In England, and many parts of the continent of Europe, acorns are extensively utilized as food for pigs and sheep, especially when other fodder

is scarce; but the amount of tannin in the "oak fruit" is an objection to its unrestricted use. And here a knowledge of the chemistry of plants is found to be of service to the farmer. If the acorn is allowed to germinate, the injurious tannin is resolved by fermentation into grape sugar and the comparatively harmless gallic acid, while at the same time the food is rendered more digestible and its nutritive properties are equally enhanced. Various methods are adopted in the preparation of acorns as food for stock. By some a hole is dug in the ground sufficiently large to contain several bushels. This is filled with acorns, which are well moistened with water, and afterwards sprinkled with a small quantity of common salt. In this hole they are allowed to remain until they have thrown out sprouts an inch and a half to two inches long, when they are removed and dried. Acorns may be similarly heated in grain pits, tanks, or any other suitable receptacle. Thus a bitter astringent vegetable product is converted into a palatable, digestible, and nutritious food.

AGRICULTURAL EXPERIMENTS.

DR. VOELCKER, the eminent chemist and agriculturist, recently gave a lecture on this subject at the Royal Agricultural College in England, at which institution he was for fourteen years the professor of chemistry. He dwelt much upon the value of experiments, but was careful to define what he meant by the term and how he believed the work ought to be conducted. His ideas are so fully in accordance with our own (as those who have been accustomed to read the JOURNAL will see) that we cannot refrain from quoting the following portions of the lecture: —

In my judgment, an agricultural experiment is not any random trial with this or that chemical fertilizer on turnips or wheat or any other crop, nor the crude attempt to test the feeding qualities of different feeding stuffs, by supplying them indiscriminately to sheep or oxen; nor is it the vain attempt to satisfy mere curiosity by playing in the experimental field or fattening stall, very much in the same fashion in which I once found a student experimenting in the laboratory, who poured the contents of half a dozen reagent bottles into one and the same test-tube, without rhyme or reason, and who, when asked what he was doing, naïvely answered that he wanted to see what baric chloride, silver nitrate, sulphuretted hydrogen, and other tests, all poured together into one and the same tube, would produce. Well, he obtained by this experiment pretty much the same thing as what is produced in so many so-called agricultural experiments, — a regular muddle, — of which neither he nor anybody else could make head or tail.

(1.) In the first place, all agricultural experiments should have for their object a definite inquiry. In illustration of this principle I may refer to field experiments, undertaken with a view of ascertaining in what states of combination nitrogen is most beneficially applied to corn crops, to roots, or to grass land. In an economical point of view it is very desirable to ascertain whether nitrogen is more useful in the shape of nitrate of soda, as a manure for wheat or barley, than in the form of sulphate of ammonia, or in the form of nitrogenous organic substances, such as dried blood or wool refuse. If it be borne in mind that the variable character of the soil in different localities, the rainfall, climate, and a number of other conditions, greatly affect the practical utility of various nitrogenous manures, it will at once appear that a vast field for experimental inquiry presents itself, having for its aim to determine the precise conditions under which nitrate of soda, or sulphate of ammonia, or other nitrogenous manures applied as top dressing, for wheat and other cereal crops, or upon grass lands, yield the most profitable returns; and how, when, and in what quantities such manures should be applied to the land, in order to produce the largest increase at the least cost. Or take the question as to the use of bones, superphosphate, and other phosphatic fertilizers in agriculture, or the question as to the benefits likely to result from the application of potash salts to land of different character and to various crops: you will readily recognize the importance of a number of inquiries which will suggest themselves to the field experimenter, from which he may be certain to derive useful information, if the plan of making the experiments is rationally laid down beforehand, and properly carried out in the field.

(2.) Having fixed upon some definite inquiry, our next aim should be to devise a rational plan of procedure in order to solve, if possible, the problems involved in the inquiry. In order to carry out field experiments successfully it is absolutely necessary for the experimenter to be acquainted with the ordinary operations on the farm, and to possess a fair and sound knowledge of practical agriculture. This is a matter which cannot be acquired by reading; you must go over and into the land, picking up one thing after another, and this of course takes time. The want of this essential accomplishment is the main cause why so many agricultural experiments have no value whatever, and why so many accounts of field trials in our agricultural publications are not worth the paper on which they are printed.

(3.) The experimenter, however, not only requires a fair acquaintance with ordinary farm operations, but likewise a well-disciplined mind, powers of observation, and punctilious conscientious accuracy. . . .

(4.) In the next place, I would observe, agricultural experiments must be repeated for a number of years before any sound conclusions can be drawn from them. A solitary experiment, I am sure you will agree with me, is not calculated to furnish solid information upon which sound agricultural principles can be established. I may refer to the careful way in which field experiments have been carried on for so many years by Messrs. Lawes and Gilbert at Rothamsted. These experiments have been now continued for nearly thirty years, and on some of the simplest questions. For instance, as to the economy of the use of nitrogen, with all their experiments they have not arrived at any very definite conclusion. Nevertheless, the experiments have given a great deal of useful practical information, and this is in a great measure due to the persevering and intelligent way in which they are continued from year to year. . . .

(5.) Finally, I may state that the experimenter must have an unbiassed mind, a sincere love for truth for its own sake, a good deal of enthusiasm, and much plodding perseverance and energy, which qualifications alone will enable him to brave and manfully to overcome the many obstacles which he is sure to encounter in practice. . . .

The lecturer went on to give more minutely some of the details that should be observed in carrying out certain experiments; but of this portion of the address our limits forbid us to give even an abstract. In concluding he said: —

I will now only briefly observe how necessary it is that experiments should be multiplied and repeated as much as possible under a variety of circumstances. You are aware that Mr. Lawes has grown wheat for twenty-five or twenty-six years on the same land. At Woburn I have already come to a stand-still on that point in the fourth year. The permanent wheat there this year would be considered a disgrace to a practical farmer, and the fact is evident that, while at Rothamsted wheat has been grown for twenty-five years, at Woburn, by means of sulphate of ammonia and nitrate of soda, I have in four years succeeded in drawing out from the land the food necessary for a good crop of wheat. This shows the necessity of multiplying the experiments, so as to vary the conditions as much as possible, and I am sure you cannot be more usefully employed, when you have left this college and have taken a farm on your own account, than by reserving an acre or two for experimental purposes.

QUEER THINGS IN THE WEST.

A CORRESPONDENT of the *Ohio Farmer's Journal* gives an entertaining account of his observations at the West (some of the elder of us, by the way, remember when Ohio was "the West" of the New England emigrant), from which we cull the following paragraphs: —

The Eastern man who travels for the first time through the "great West" sees many things that strike him as "queer." I do not mean funny or ludicrous, but unexpected, different from what he had imagined or supposed. One of the first queer things is that "the West" is a very hard place to find. In Indiana people are selling out and "going West." In Illinois, Iowa, and Wisconsin it is the same. He hears the cattle men complain that they cannot compete with "the West" in the production of cheap beef. You never reach the place where the people admit they live "out West." If one is from Ohio he is called an "Eastern man." In Central and Western Kansas, Nebraska, and in Dakota the queer thing is the entire lack of fences and bridges, or any need of them. All the farms are "out-doors." The new settlers build their cheap houses, break the virgin prairie, ready cleared of stumps and stones, and begin grain-raising. Herd laws or a herd-law sentiment makes it unnecessary for the grain-raiser to fence his grain. The rule is to fence the stock, and not the grain. It is the cattle that do the damage; therefore they should be fenced. This is the sensible view to take, at least in a new country. And so for miles and miles the grain fields are "out-of-doors," as the child expressed it; and this lack of fences gives an Eastern man first a feeling of immensity, and then of loneliness.

In Colorado one queer thing is the dryness of the atmosphere. True, it was unusually dry this summer when I visited it, but it is always a dry atmosphere. Squashes and pumpkins "keep forever" in the cellars of Denver. Nothing rots, — it dries up. Everything dries up. The shingles on the roofs all seem trying to warp into small wooden stove-pipes or large macaroni rolls. Everything dries up except the people, and they would but for the saloons! Another queer thing is that when it does rain it makes such a mess of it. It tears things up. It is like the man who "did n't comb his hair but once a month, and then it half killed him." My friend the General and I started off for an afternoon's drive among the irrigated farms and gardens near Denver. We crossed a long bridge. "What 's this bridge for?" "This is Cherry Creek." "Where 's the creek?" "You 'd see, if it happened to be on a rampage." We crossed the Platte River, too, a few rods further on, now the merest brook. At six we returned from our drive, and as we crossed the bridge over the Platte not a dozen yards up stream we saw the river coming madly on, a mighty, turbid torrent, bearing logs and limbs and rubbish, and piled up three feet deep al-

most perpendicularly, rushing downward over its dry bed. I had noticed a shower off southwest, among the mountains, a few hours before. It did n't even sprinkle in Denver, but the river announced the fact that there had been a "heavy dew" among the mountains. The country is nearly level, slightly rolling, and the rains on Western Kansas and Eastern Colorado have been very light for centuries, and have formed no gullies to speak of. I do not remember seeing a bridge, and there is a good wagon-road all along, beside the track; yes, a splendid road, for the level prairie, when once trodden with wheels, becomes almost as hard and smooth as a concrete pavement in the city. It is a great help to the new settlers that there are no fences or bridges to build, and no roads to make. Taxes are light, and all the labor can be put on the cultivation of crops.

GLEANINGS.

WATERED BUTTER. — The London *News* says: A new terror is added to the butter dish by a disclosure made on the authority of an agricultural contemporary. It is stated that in Cork there exists the pleasing custom of increasing the marketable weight of butter by the addition of undue quantities of water. A skilful manipulator, we are informed, can "work in" from eight to ten pounds of water into sixty pounds of butter. Butter thus manipulated will, when newly made, present all the appearance of first quality, but after it has been kept for a week or ten days it rapidly deteriorates, and finally becomes uneatable. In the Cork trade the practice has become so well established that it has been found convenient to give this class of butter a particular name, and it is known as "Cocks." The authority from which we quote makes an appeal to the trade to discountenance this practice, inasmuch as "its continuance will of course injure the character of the Cork or other market butter."

PRIZES FOR SUPERIOR MILK. — A fully equipped laboratory has lately been added to the London establishment of the Aylesbury Dairy Company, where samples of milk received from farmers will be subjected to chemical analysis. Dr. Paul Nieth, a German chemist of high reputation, who has been devoted for the past eight years to the investigation of "the chemistry of the dairy," is in charge of this laboratory. The company has also offered prizes consisting of pieces of plate valued at £120 ($600), to be given to those farmers whose milk supply stands highest in quality between October 1st and March 31st next. The samples of the milk supplied will be carefully examined, as at present, by the company's analyst, whose analyses and reports will decide the competition finally, and without appeal. In this way a considerable amount of information will be obtained as to the methods of producing the richest possible milk. The exact data obtained by numerous analyses will be available for scientific information and for practical purposes.

PROPAGATING FUCHSIAS. — The following method of raising young fuchsias and plants is said to be practised by cottagers in the west of England: "In the autumn, after the frost has destroyed the foliage, the wood of the present season is cut off close to the ground, and laid like a sheaf of wheat in a trench a foot deep. The bundle is covered with a few inches of soil, and here it remains until spring, when a multitude of young shoots may be seen pushing their way through. The soil is then carefully moved, and with a sharp knife a cut is made each side of a joint, and the result is rooted plants enough for the parish. The old stool throws up more vigorously than before, to be served in the same way the following autumn."

IODINE IN GUANO. — In rendering guano soluble, violet vapors of iodine are evolved when the mass has reached a temperature of 110° to 120° F.

Boston Journal of Chemistry.

JAS. R. NICHOLS, M. D., *Editor.*
WM. J. ROLFE, A. M., *Associate Editor.*

BOSTON, JANUARY 1, 1881.

THE JOURNAL.

IT will be noticed by our readers that some changes have been made in the title-page of the JOURNAL, by which it is hoped it is improved and the character of the paper more distinctly indicated. At the time of the establishment of the JOURNAL in 1865, it was designed to devote much the largest space to *chemistry*, theoretical and practical, and hence a name was given to it which would be in conformity with its design and character. It was soon found that the familiar style adopted in its conduct, and the interesting nature of the articles, had drawn to it a large number of readers from all classes, outside of those directly interested in chemistry. The number of patrons among farmers, horticulturists, teachers, artisans, heads of families, physicians, clergymen, dentists, apothecaries, literary gentlemen, etc., so rapidly increased that it became necessary to change the direction of the JOURNAL in no small degree, and to give it a more popular character. It became from necessity in its early history a monthly *review of Popular Science*, and has so continued to the present time.

The paper having acquired its high reputation and wide patronage under the original title of "Journal of Chemistry," it has been thought hazardous to change this, and hence the old familiar name, borne for nearly a sixth of a century, has been continued. Under it our old friends and patrons hold to us with wonderful persistency, and many new patrons are constantly joining our large family of readers; still, it cannot be doubted that the name *repels* thousands who do not understand the scope and nature of the JOURNAL. Chemistry in itself is regarded as a science not easily comprehended by common readers, and hence they turn from a journal professing to be devoted to its interests. The addition of the name "Popular Science Review" will in a measure, we hope, assure strangers that we present a monthly *résumé* of all the sciences, and adopt language which all intelligent readers can understand.

It is hoped the new name will facilitate the efforts of our friends in adding to our list of patrons. The JOURNAL is now one of the oldest and most influential journals of science in the country or in the world, and if the opinion of those who ought to know is taken, it has accomplished much good as an educator, and as a safe guide in important matters of household concern.

PUBLISHERS' NOTICE.

ALL moneys received for subscriptions *previous to December 20th* will be credited on the address labels of the present number. As the mailing lists have to go to press on that date, subscriptions received later cannot be acknowledged in that way until the next number, the labels of which will cover receipts up to January 20th; and so on.

Subscribers who have sent money which, in ordinary course of mail, should have reached Boston before December 20th, should write to the publishers *at once* if the remittance is not credited on the label of this number. If there has been any delay or loss in the mails, it is important that it should be investigated promptly.

Our friends understand that if they send *money* by mail, unless in a *registered* letter, they do it at their own risk. *Drafts* on Boston or New York and *postal orders* may be sent at the risk of the publishers in unregistered letters.

A NEW GAS-PRODUCING SUBSTANCE.

A SUBSTANCE resembling sun-baked clay, of a light brown color, has been placed in our hands for chemical examination by Mr. Greenough, treasurer of the Boston Gas Company. It is a very remarkable substance, and is said to be found in Mexico, — in what quantities we do not know. At first view it was thought to be a mass of infusorial earth; but under the microscope no trace of organic remains could be found, and except for the occurrence of irregular particles of quartz dispersed through it it is perfectly homogeneous. The matter of most interest is its chemical composition.

A quantitative analysis of the substance gave the following results: —

Moisture	2.71
Hydrocarbons volatile at a red heat	71.00
Fixed organic carbon	8.99
Ash	17.30
	100.00

The ash was constituted mostly of grains of quartz. It will be seen that the quantity of gas-producing hydrocarbons is very large, — much larger than is afforded by the best bituminous coal. When burned they give a clear, luminous flame, apparently free from sulphur vapors. Distillation affords a red, oily substance, of nearly the consistency of butter, and having a very offensive odor; which odor is not perceived when burned. The origin of this mineral is not clear, but is probably due to causes similar to those which originated the oil-bearing strata of Pennsylvania. It may be assumed that in such instances gaseous hydrocarbons are formed from the decomposition of organic remains, which become liquid under pressure, and the liquid is readily absorbed by disintegrated rock or quartzose sand. The structure of this substance shows lamination, which proves that it has been under great pressure.

The mineral is certainly very interesting and remarkable, and if it is found in sufficient quantities and at points of ready transportation it will prove a valuable material for enriching illuminating gas, — a substance much needed, now that the Albert mine of rich bituminous coal is nearly exhausted. For purposes of comparison we present the analysis of a specimen of the best gas-making coal procured from the Boston Gas Company: —

Volatile hydrocarbons and moisture	58.44
Fixed organic carbon	18.76
Ash	22.80
	100.00

NAPHTHA FOR MOTHS.

A CORRESPONDENT inquires if the action of benzine or naphtha upon carpets or other woollen fabrics is injurious in any way. In the use of these agents the design is to destroy moths, and the remedy is generally effective; but they

are dangerous substances to use in families. Inflammable as gunpowder, the vapor is liable to ignite from a match or spark, and when ignited, mixed with air, an explosion occurs as destructive as that from gunpowder. The liquids should always be used with great caution, and only in an out-building away from fires. A perfectly pure naphtha does not injure woollen fabrics, but if it contains resinous or bituminous substances it makes carpets hard and sometimes sticky. The article sold as *gasoline* is the lightest and purest of the naphthas, and can usually be procured of druggists. It flies into vapor quickly, at even low temperatures, and should be used in a closed vessel if possible.

SCIENCE FOR BABES.

In the JOURNAL for November, we referred to a kind of elementary science teaching "that does not teach," and the London *Saturday Review* has since been showing up the same sort of "science for babes" as furnished in English school-books. Certain twopenny manuals of animal physiology prepared by a Manchester teacher, according to the reviewer, "deserve to be placed in the most damnatory chapter of an *Index Expurgatorius* by every one who has a respect for childhood, for sound culture, or for the future of the human race." The following extracts from the books, with his comments upon them, will convince the reader that the judgment is not too severe: —

On page 5 of the first volume (the one appointed for eleven-year-olds) we have a definition of man "zoölogically:" —

Man is described by the zoölogist as standing at the head of the animal kingdom. He is described as forming the only species in the order Bimana (two handed animals), of the class Mammalia (suck-giving animals), of the sub-kingdom Vertebrata (backboned animals). He is further described as breathing atmospheric air by means of lungs; as possessing warm red blood, driven into circulation through his body by the action of a double heart, possessing two ventricles and two auricles; as producing living young, and nurturing them by means of milk secreted by the mammary glands; his skin more or less covered with hairs and scales; as possessing two hands and two feet, each five-fingered, the nails at their extremities flat and broad; and as possessing all his teeth even and close to one another, and his molar teeth equally enamelled.

This is pretty well; and we only hope that the eleven-year-olds will not be led by the metaphorical expression at the opening to conceive the idea of a groom standing at the head of a horse named Kingdom, and that no awkward mistakes will arise from the use of the masculine in describing the process of nurture. Youth is prone to such little errors when its brains are overdriven. But the sentence at least does not contain many words — only perhaps a score or two — which are meaningless to the learner. Further on we come to the real thing: —

The transverse ligament of the atlas binds it to the odontoid process of the axis vertebra, so as to form a pivot joint on which the head rotates. The glenoid ligament helps to attach the humerus to the glenoid cavity of the scapula at the shoulder-joint. The ligamentum teres (round ligament) and the capsular ligament retain the thigh-bone in its socket, the acetabulum.

The emollient effect on the morals of eleven which must necessarily be produced by the learning by heart of this Abracadabra must be truly marvellous.

In the next Standard the author *majora canit*. He explains scientifically the things of common life. Youths of twelve are quite ignorant of what jumping means. He tells them: —

Jumping or leaping is effected (1) by the sudden contraction of the muscles of the calf, by which the heels are suddenly raised and the body jerked off the ground; (2) by the simultaneous contraction of muscles which bend the thigh on the pelvis; (3) by the sudden extension of the legs by the contraction of the extensor muscles; this movement following immediately on the two movements first described.

Obviously this lucid explanation will be of little use unless (as an instructor of youth who anticipated the method observed) "he goes and does it." The joy of intelligent youth when for the first time it consciously contracts the muscles of its pelvis may possibly be a consolation for the trouble of learning. A young philosopher who can define himself as a person who nurtures his young, etc., and who knows that he jumps by contracting the muscles of his pelvis, is obviously ready for instruction in higher things still. Accordingly, in Standard VI. he plunges full into psychology: —

Sensation is the process by which we become conscious through the brain of impressions received and transferred to it by the afferent or sensory nerves. When sensation is excited normally — that is, by external agency — it is called objective sensation. But when it arises without any external cause — that is, is produced by the unprompted or rather intrinsic action of the nervous system itself — it is termed subjective sensation, as in the case of the "ringing in the ears" sensation, with which most are more or less familiar, also in the seeing of ghosts as the result of indigestion.

Thirteen or fourteen ought (we speak under correction) to be the age of this future ploughboy or shoemaker. In half a dozen lines he knows all about it. Problems of brain and mind, life studies of Lockes and Humes, and such-like antiquated people, theories of the supernatural, — there they are, all dried, cut, and crammed by hydraulic pressure into the smallest space for him. . . . The education of the future is apparently to consist of getting by rote a jargon which is for the most part meaningless, however carefully explained to the learner, which conveys to him no sort of really useful recreative or stimulant knowledge, which loads and wearies his brain at the time when it should be lightly burdened, and which, to crown all, could be mastered at another time and in another fashion without the slightest trouble by those who have time and vocation for such studies.

METEOROLOGY FOR NOVEMBER, 1880.

THE sum of my observations on the weather for the past month has been as follows: —

Average Thermometer.		Lowest.	Highest.	Range.
At 7 A. M.	30.27°	10°	60°	50°
At 2 P. M.	42.23°	22°	64°	42°
At 9 P. M.	34.63°	15°	60°	45°
Whole month	35.71°	10°	64°	54°
Last 17 Novembers	36.08°	31.12° in 1873	42.53° in 1877	11.41°
Last Autumn	49.53°	10°	86°	76°
Last 17 Autumns	48.182°	42.84° in 1864	52.51° in 1877	9.67°

The average barometer for the month was 30.193 inches; the lowest 29.48, on the morning of the 7th, and the highest 30.45, on the morning of the 24th, giving a range of .97 of an inch. The sum of the daily variations was 7.37 inches, giving an average daily movement of .2456 of an inch. The largest daily movement was .59 on the 7th and again on the 20th, each the day after the two principal rainfalls.

The face of the sky in 90 observations gave 55 fair, 10 cloudy, 16 overcast, 7 rainy, and 2 snowy; a large proportion fair, and very few observations actually stormy. The amount of rain and melted snow ($\frac{1}{2}$" inch only) was very small, only 1.90 inches; the largest amount at one time being .85 of an inch. The average amount for the last twelve Novembers has been 4.146 inches; the lowest amount 1.62 in 1874, and the highest 7.45 in 1877. This long-continued small amount of rain keeps the springs and water supply very low, the entire amount for the past four months being only 10.31 inches. The last three autumn months gave only 6.74 inches, while the average for the past twelve autumns has been 10.87 inches.

The direction of the wind, noted as usual, gave an excess of 3 southerly and 65 westerly over the northerly and easterly, indicating the approximate average direction to be south 87° 20′ west, or very nearly due west. It is the only instance during the last twelve years when the southerly winds have prevailed over the northerly in November.

In general, it may be said of the past month that it was distinguished for the small amount of rain, for southerly winds the first twenty days, and for continued severely cold weather the last ten days of the month, giving an average of only 23.13°, equal to the usual cold of December and February, while the first twenty days averaged 42°, nearly equal to an average April. The severity of the closing ten days extended over a large part of the country, — a wide-spread cold wave, taking a week to cross the continent, and visiting nearly every section, including a large part of the South. During the past 17 years we have had repeated waves of cold as severe, and even much more so, but more limited in extent and duration. In November, 1875, the thermometer sank to one degree below zero, and in 1867 to two below. In five other Novembers the thermometer went below this of 1880, but all these severe snaps were short and more local. The one in 1875 was very sudden, sending the mercury down from 42°, the warmest morning of the month, to one degree below zero the next morning, the lowest point of the month, and four days later it rose again to 26°, with an average through the day of even 31°. The other cold spells in November were short, though not equally sudden, and consequently of limited extent. But notwithstanding the cold spell in closing the last month, the entire autumn has been above the general average in temperature, as seen by the table, and as a whole a very pleasant and favorable autumn for the farmer and all out-door employments. D. W.

NATICK, *December* 6, 1880.

EDITORIAL NOTES.

HELIOGRAPHIC SIGNALLING IN THE OLDEN TIME. — It seems that heliographic signalling is no "modern improvement." This method of utilizing sunbeams for sending messages as quickly as the telegraph — without, however, being liable, like the latter, to be cut by hostile forces, for the heliograph signals over the heads of the enemy — was practised at least as early as the commencement of the sixteenth century. According to a ballad as old as 1511, some kind of heliograph was used in the fight between the Great Harry and her consort, under Lord Howard, on the one side, and the Lion and the Union, under Sir Andrew Barton, of Scotland, on the other. Lord Howard is represented as having met at Thames mouth a merchantman which had been plundered by the Scotch admiral, and the captain offered to sail back with him and assist in the forthcoming fight if he were armed with a few pieces of ordnance. He was also to signal to the English admiral, when he made out the enemy, by means of a "glasse," and it is clear from the account given of it that the latter was some sort of heliographic signal; for the ballad says: —

> "The merchant set my lord a glasse
> Soe well apparent in his sight,
> And on the morrow by nine of the clock,
> He showed him Sir Andrew Barton, Knight."

OLD AND NEW BRIDGES AT MAYENCE. — Work has recently been commenced upon the fixed bridges over the Rhine at Mayence, the only means of crossing, with the exception of the railway, a mile or more above the town, having hitherto been by pontoons. This is of importance for the city, as twice during the last winter, at the breaking up of the ice, all connection with the opposite shore was cut off. To give, for the present, a navigable depth of water, the stones and posts of the old bridge between May-

ence and Castel, built by Charlemagne, are being removed from the bed of the river. Between 796 and 803 A. D., this emperor caused a wooden bridge to be built over the Rhine upon twenty-five piers, which was subsequently struck by lightning and burnt to the level of the water. The numerous boat-mills at this place have been anchored to its piles. Up to this time about fifty of these piles, each from fifteen to twenty feet long, have been lifted from the bottom of the Rhine. The oak wood, a thousand years old, is still so well preserved that it can be employed for carpentry-work, and even the iron found in the posts, which is covered by only a thin coating of rust, is fit for service.

PROVIDENCE OF BEES. — The Melbourne correspondent of the *Dundee Advertiser* narrates the following interesting proof of the provident and far-seeing instinct of bees: Turning from men to insects, a singular circumstance is reported from a hot, dry valley in New South Wales. Last year the drought there was of long duration, and the denizens of the apiaries suffered much from it. This year the bees have made provision against a similar emergency. They have filled a large number of the external cells in every hive with pure water instead of honey. It is thought that the instinct of the little creatures leads them to anticipate a hot summer. But that they should have gone further, and, by an act which, as far as I know, is without precedent in the habits and customs of their tribes, have created reservoirs to tide over the water famine, is a noteworthy fact indeed.

THE TELEPHONE AND FIRE-DAMP. — It is well known that if a long, dry tube, open at both ends, be held over a jet of burning hydrogen a musical sound is produced, the pitch and quality of which vary with the length, thickness, and diameter of the tube. It has been proposed, says the *Electrician*, to adapt such a tube to the safety-lamp underground, and to place it near a telephone in communication with another telephone in the manager's office on the surface. The alteration of the sound, due to a greater or less admixture of gas with the air of the mine, would warn the manager of the state of the atmosphere in the workings.

AN ITALIAN CAPTIVE BALLOON. — At the National Exhibition, to be opened at Milan next year, there will be a captive balloon, on the model of the one which was so successful in Paris in 1878. It will measure not less than 180 feet in circumference, 84 feet in height, and contain 15,000 cubic feet of gas. To it will be attached a safe and solid car, capable of containing seats for at least eight persons. A steam-engine is to regulate the ascent and descent, and it will rise to the height of about 900 feet, affording a splendid view of Milan and the plains of Lombardy. The balloon will be constructed at Milan, Mr. Henri Beudet, the well-known and experienced aeronaut, having been sent for to direct the work.

A CHINESE GIANT. — According to *Galignani*, great excitement was recently caused in Paris, in the Palais Royal, by the visit of Chang-yu-Sing, a Chinese giant. Every one wanted to see him. People left their shops and hastened to have a look at the huge man, who measures 2.45 metres (8 feet), is 33 years of age, and weighs 180 kilogrammes (396 lbs.). He is a well-made man, wears a black mustache, and appears very intelligent. On his visit to the Magasins du Louvre to buy No. 10 gloves, as the shopman had to go upstairs to find some of that unusual size, M. Chang quietly lifted him up from the ground and landed him at the top of the stairs. M. Chang dresses in European style, is said to be very learned, and to speak English, French, German, and Japanese. He is said to be on his way to New York.

THE POPULATION OF THE EARTH. — Boehm and Wagner calculate and show the population of the world to be very near fourteen hundred and fifty six millions of people, and nearly seventeen millions more than it was at the time of the last issue of their publication, nineteen months ago. It seems rather startling, at first sight, to find that the population of the earth is increasing at the rate of *nearly a million persons per month*; but a little consideration shows that this is quite possible, since the rate of increase of population in most countries, of which we have trustworthy statistics, exceeds one per cent. per annum. Asia is said to contain considerably more than half the population of the globe, or eight hundred and thirty-five millions; Europe, three hundred and sixteen millions; Africa, two hundred and six millions; America, ninety-five millions; Australia and Polynesia, four millions. Bearing in mind the different areas of the continents, we can see that America will long be able to absorb, to the advantage of itself and of all other nations, the surplus population of the rest of the world, even if it should exceed twelve millions per annum.

ATOMS.

THE San Francisco *Post* says it is an "open secret" that a certain mining millionaire of that city recently ordered a copy of the Venus of Milo from Florence, on the strength of its reputation, and when it arrived, being disgusted to find the arms missing, actually sued the Pacific Central Railroad Company for "mutilating a work of art;" and, what is more, the jury awarded him substantial damages! — Among the most hard-working young doctors of the Vienna hospitals is the Duke Charles Theodore, of Bavaria, brother of the Empress Elizabeth; he took his diploma some time ago, has practised assiduously ever since, and is a clever operator. — The *Scientific American* remarks: "It would seem that nations prefer not their own thermometers, but other people's: it was Germany that invented the Fahrenheit scale, which we have appropriated, the Fatherland itself preferring to employ that of a Frenchman, Réaumur; while France will have none of Réaumur, but uses the Celsius, or centigrade, whose introduction is due to a Swede." — Pines and other needle-leaved trees, and especially those containing resinous matter, absorb and exhale more water than other species. — Recent experiments by Piazzoli appear to establish the fact that the tenacity of iron increases on magnetization. — It appears that the rings of trees do not always denote a year, for the blue gum tree of Australia sheds its bark twice a year; a tree recently hewn, that was known to be only eighteen years old, showed thirty-six distinct rings of growth. — Enlargement and improvement is the order of the day with the medical magazines; the *Medical and Surgical Reporter*, the *Philadelphia Medical Times*, and the *New York Medical Journal* all promising an increased number of pages for 1881, with no increase of price. — The *Boston Medical and Surgical Journal*, enlarged a year ago, and now one of the most popular of professional periodicals, is hereafter to be edited by Dr. George B. Shattuck, with able helpers in New York, Philadelphia, Baltimore, and elsewhere. — The *Eclectic Magazine* will also be enlarged, so as to give about two hundred more pages during the year. — The *Popular Science Monthly* is another magazine that is to give us more and better at the old price. — *Lippincott's Magazine* reduces its price to $3.00 a year, without reducing its size, and offers increased attractions. — A British Keely seems to have turned up in Yorkshire, and to have applied for a patent on an engine, which, he says, "is perfectly and entirely self-acting, creating its own power, without any agency, except the pressure of the atmosphere, which the construction and arrangement of the engine converts into a substantial active power, which is limited only to the strength of material, and supplies a continuous source of power by its action;" and it is going to save $600,000,000 a year in fuel, labor, etc., in the United Kingdom alone! — An electric railway is to be built in the suburbs of Berlin, on a larger scale than the experimental one in the city, which is considered to have proved the feasibility of the enterprise. — The consumption of horse-flesh in Paris has reached the high figure of about four million pounds a year.

LITERARY NOTES.

THE APPLETONS publish *A Physical Treatise on Electricity and Magnetism*, by J. E. H. Gordon, B. A., Assistant Secretary of the British Association, in two handsome octavo volumes, with some two hundred illustrations The work fills a gap in our scientific literature. There was need of a treatise that should be fuller than the elementary books on the subject, and yet consider it from the physical rather than the mathematical side. Hundreds are interested in the former treatment where one is in the latter. The author has done his work thoroughly and well, giving us much recent matter not to be found in other textbooks. Every teacher and every advanced student of physics, as well as every amateur who goes into the subject otherwise than superficially, will want the volumes.

Chemical reactions, and the methods of representing them by equations, are often imperfectly understood even by those who have studied the ordinary text-books of chemistry. We had a letter not long ago from a student who said he had been through Barker's *Chemistry*, but felt that he did not understand the expression of chemical processes by equations, and he asked us to recommend some book that would give him special help in that direction. Such a book we now have in the little *Introduction to the Study of Chemical Reactions*, by Dr. E. Drechsel, professor of physiological chemistry at Leipzig, translated by N. Fred. Merrill, Ph. D. and published by J. Wiley & Sons, New York. The translator has not only given an accurate English version of the original, but has adapted it to the wants of American students by explanations and notes of his own. It is well worthy the attention of teachers and students.

The valuable series of papers on *The Open Fireplace*, written by Mr. J. Pickering Putnam, of this city, for the *American Architect*, and referred to in the JOURNAL for February, 1880 (p 13), has been issued in a neat volume by J. R. Osgood & Co. All the 269 woodcuts, illustrating the subject historically and artistically as well as practically, are reproduced. The book covers more ground than its title implies, as other modes of domestic heating are discussed, with incidental attention to ventilation, illumination, etc.

How Persons Afflicted with Bright's Disease ought to Live, by J. F Edwards, M. D., is a little handbook, just published by Mr. Presley Blakiston (75 cents), intended to show that such unfortunate people can live for many years, instead of dying prematurely, if they will follow certain hygienic rules.

The Naturalists' Directory for 1880, edited and published by S. E. Cassino, of this city, is a book of 152 pages, paper covers, containing the names, addresses, etc., of persons devoted to natural science in its various branches, with lists of scientific societies, periodicals, books of the year, etc. The list of naturalists is by no means complete, but the editor will be grateful for information that will enable him to supply omissions in the next annual issue. He intends, moreover, to prepare an *international* directory of the kind.

Diet for the Sick, by J. W. Holland, M. D., is No. 1 of a "Pocket Series" of popular medical handbooks published, at 25 cents each, by J. P. Morton & Co., Louisville, Ky. If the series goes on as well as it has begun, it ought to be a success.

The *Physician's Handbook for* 1881, published by W. A. Townsend & Co., besides the usual blank pages for accounts, has 134 closely printed pages of just the kind of practical information that it is convenient for the practitioner to have in his pocket. It may be found, with all the new books, medical and other, at Williams & Co.'s.

Those who wish to get the most for their money in buying books for the young at this holiday season cannot do better than to select the bound volumes of the standard juvenile periodicals, which furnish quite a library of illustrated reading at small expense. The first volume of *Harpers' Young People*, for instance, costing $3.00, includes several complete books, and enough matter to fill half a dozen more, with more than 700 pictures, many of which fill the ample quarto page. The two volumes of *St. Nicholas* for 1880 ($2.50 each) contain about a thousand octavo pages of reading, and hundreds of illustrations of a really artistic character. The *Wide Awake Pleasure Book* gives for $1 25 a volume of the favorite magazine from which it gets its name; and *Babyland*, at 75 cents, is the cheapest and prettiest of books for the youngest of the family. Estes and Lauriat have, as usual, the "veritable" *Chatterbox* ($1.25) from England, and Mr. Butterworth's *Zigzag Journeys in Classic Lands* ($1.75), a book full as good as its predecessor, which we commended a year ago.

A bound volume of *Scribner's Monthly* ($3.00) is an "art-book" that, if published as such, could not be afforded at double the price.

Mr. Rolfe's edition of *The Taming of the Shrew* will be published this month. Any or all of the twenty volumes of the series already out can be ordered through the Journal of Chemistry Co. They will be sent, postpaid, at 60 cents each in cloth or 40 cents in paper.

Medicine and Pharmacy.

INTERESTING EXPERIMENTS ON TOBACCO-SMOKING.

It was discovered, some years ago, that carbonic oxide is one of the products of the combustion of tobacco, and this has led to the suggestion that the injurious effects of smoking may be due to this extremely poisonous gas. M. Gustave Le Bon has thought the question worthy of careful investigation, and his experiments are of no little interest. He found that about eighty cubic centimeters of carbonic oxide were produced by the combustion of one gram of tobacco. One per cent. of the gas in the air will cause death in twenty minutes, and a much smaller proportion will give rise to violent headache, nausea, and other disagreeable symptoms. Former experimenters had killed dogs by making them breathe air which had passed through burning tobacco; but the fatal effects might be due to the large amount of nicotine or to the diminution of the oxygen in the air. Similar objections might be made to other experiments in which the conditions were wholly unlike those of ordinary tobacco-smoking. M. Le Bon, on the other hand, has made his examination under these latter conditions.

It was necessary first to determine the minimum proportion of carbonic acid that renders the air unfit to breathe (a point not definitely settled by the physiologists), and, second, the maximum proportion actually present in an atmosphere laden with tobacco smoke. To decide the first question, M. Le Bon shut himself up in one of the smallest of French kitchens, with two charcoal stoves. In this room it was ordinarily necessary, for safety, to have the door open; but he closed the door, and remained until the headache and nausea became intolerable, and he was hardly able to take a sample of the air in a rubber bag and make his escape with it. Analysis showed that the air contained only one part of carbonic oxide for 3000 parts of air. "In order to produce this proportion of carbonic oxide, it would be necessary to burn 4 grams of tobacco per cubic meter of air. In a small room — say, one of a capacity of 30 cubic meters — it would be necessary to burn 125 grams of tobacco to produce this quantity of carbonic oxide, an amount of tobacco which would be represented by 50 pipes, 25 cigars, and 250 average cigarettes." The entrance of fresh air by the door and windows, even if these were closed, would require the amount of tobacco to be much larger; but it is evident that even this quantity could not be burned by the small number of persons who could be accommodated in such a room. In a compartment of a European railway car, however, or in a closed cab, a number of smokers might be confined in a much smaller atmosphere; though the ventilation through cracks and crevices would be greater than in the other case. To test the matter by actual experiment M. Le Bon and a friend entered a single-seated cab, which, deducting their own bulk, contained about thirty cubic feet of air. The windows of the cab were closed, and for three quarters of an hour the gentlemen drove about, and smoked during the time seven grams and a half (a quarter of an ounce) of tobacco. The temperature in the cab was 55° F. at the commencement of the experiment, and 71° F. at the end. By this time some discomfort was experienced, and a sample of the air was taken for analysis. According to the quantity of tobacco burned, the air should have contained 500 cubic centimeters of carbonic oxide in each cubic meter of air; the quantity was found, however, to amount to scarcely 100 cubic centimeters — too small a quantity to produce serious inconvenience. It is thus evident that in a carriage, in spite of closed windows, the greater part of the carbonic oxide escapes. It is also certain that, even if it did not escape, the effects of the nicotine and other poisons produced by tobacco-smoking would be felt long before there could be sufficient of the oxide in the air to cause any serious discomfort or injury. If a man kills himself by smoking, then, he may be sure that it is *not* carbonic oxide which is primarily responsible for the fatal result.

THE MEDICAL PROFESSION AND MANUFACTURING PHARMACISTS.

There is an able editorial article on this subject in the last number of the *Detroit Lancet*, which takes the ground that the manufacturing chemists and pharmacists are important allies and helpers of the physician. They devote themselves to studying and supplying the legitimate wants of the profession. The following extracts from the article will serve to show its drift, and we are confident that every candid reader will admit its justice: —

With the aid of the best practical talent they can procure, they prepare the chemicals and medicinal preparations that the profession desire. By their combination of abundant capital, the best business talent and experts in every department of manufacture, they have been able to render medicinal preparations at once uniform in quality, elegant and convenient in form, and moderate in price. Further, they have been and are ready to spend time and money without stint in the search for new drugs, and in devising new and more desirable forms for their exhibition. We are sure that all who have given the matter sufficient attention to reach the real facts in the case will agree in the statement that the manufacturing pharmacists are the closest allies of the medical profession, and that the interests of the two are in perfect harmony; that the former are content to be permitted to serve the profession in any manner that the profession may direct in regard to the procuring and preparation of the several articles of the materia medica. Further, they are on the lookout for any mineral or vegetable substance which may be of interest or value to the physician. . . . .

We are aware that some look with suspicion upon this enterprise in the introduction of new remedies. But it seems to us that it is strictly in the interests of the wide-awake physician. Unable ourselves to obtain a supply of new drugs at prices which admit of their general use, if found good, shall we not accept the services of those who obtain those drugs for us? If any particular firms are dishonest or dishonorable, or incompetent in their attempts to render this service, let the facts be made known. But when in these respects the reputation of these firms is unimpeachable, it seems to us the height of folly to refuse such excellent and efficient aid; aid in what we cannot do ourselves or obtain any one else to do for us. . . . . If the new drug possesses positive merit it takes its place in the recognized materia medica. If it has no such merit it soon falls into oblivion. In either case the manufacturing pharmacist is profited only as he renders positive service to the physician. For ourselves, we are glad that the profession has such capable assistants. It is only by this aid that we can ever hope to obtain from the vegetable and mineral kingdoms the agents that will best suit us in our efforts to meet every indication offered by the multiform disorders of the human body.

As regards the work of any particular firm, it is entirely proper that the profession should watch it with the most scrupulous care, and make it clearly understood that its patronage of that firm, as of all firms, rests upon the capacity of the firm to do its work well, and upon the practical evidence that it constantly exercises this capacity.

LIGHT AND NUTRITION.

The influence of light upon the nutrition of the animal body is a subject which appears to have received more attention from the practical physician than from the physiologist. There are few persons who do not believe in the hygienic value of abundant light as well as of fresh air; but it has been difficult to point to other than pathological or negative evidence in favor of this opinion. We have now at our command definite physiological facts respecting the influence of light upon the excretion of carbonic acid in the lower animals. These are the results of investigations carried out by Moleschott and Fubini, of which we find an abstract in the *London Medical Times and Gazette*. By carefully arranged experiments these observers were able to estimate, not only the comparative, but the absolute or quantitative, effect of light upon amphibia, birds, and mammals, and to exclude from the result the effects of temperature and movement. The result was in all classes of animals so far the same, — the admission of light to an animal, which had been previously kept in the dark, raising the amount of carbonic acid excreted from 20 to 40 per cent., and from 11 to 27 per cent. even when the animal had been previously blinded. It thus appears, as we should have expected, that light affects nutrition not only through the retina, but also through the skin. What is more remarkable is that the nutrition of the muscular system, after removal of the skin, central nervous system, and eyes, was found to be 50 per cent. more active in light than in darkness; while the brain and spinal cord similarly tested showed similar, though less marked, nutritive activity under the influence of light. Further experiments showed that blue-violet light exercises precisely the same influence on nutrition as white light; while red light affects frogs similarly to darkness, although it stimulates nutrition to a moderate degree in birds and mammals. The individual tissues proved to be affected by colored light in much the same way as the entire body.

ARSENICAL WALL-PAPERS AGAIN.

Dr. John H. Clarke, of London, writes to the *Lancet* as follows, under date of November 19th, and the hints may be of service to practitioners in this country, where these poisonous papers have by no means gone out of use, notwithstanding all that has been done to warn the public against them: —

Will you allow me to call the attention of the profession to the fact that arsenic is now more largely used than ever in the manufacture of wall-papers

and to warn them to bear in mind the presence of the poison as a possible cause of disease, or of complications of diseases? A large number of cases of suffering from this cause have come under my notice of late, and I was at a loss to understand them until I tested the wall-papers and found in them quantities of arsenic, and was unable to make any impression for good on the patients until the wall-papers were removed.

Smarting in the eyes, though a fairly constant symptom, was not always present, and when present was not always a leading symptom. Deep general debility, a continued feverish state, chronic coryza, hæmoptysis, sickness and retching, cramps, spasms, diarrhœa or constipation, I have observed in various cases.

It should be remembered that it is not the green papers alone that contain the poison. It is largely used in the manufacture of other colors. I have found it in yellow, pink, blue, and drab, and no doubt it is to be found in many more.

It is surprising how many houses there are, especially among those of the poor, which have arsenical papers in one or more rooms, and it would be well if every practitioner had one of the simpler tests for arsenic always ready for use. It would, I have no doubt, afford a solution for many a trying case, and save an immense amount of needless suffering.

The extreme sensitiveness of some persons to this kind of poisoning is illustrated by a case recently reported in England, in which serious illness was shown to be due to the small amount of arsenic left on the walls after a paper highly charged with the substance *had been removed* and a harmless one substituted. The latter was subsequently taken off, and arsenic was detected in the greenish streaks left on the plaster by the old paper. The plaster, which seemed to have absorbed an appreciable amount of the poison, was removed and the walls were replastered, after which no further trouble was experienced from this source. It seems almost incredible that arsenical poisoning could take place under such circumstances, but the case was carefully examined by medical men and chemists, who satisfied themselves that it really did occur. It is, after all, only one case out of many which prove that some constitutions are peculiarly susceptible to minute quantities of arsenic in the air.

COMPOUND LICORICE POWDER.

THE "pulvis glycyrrhizæ compositus" of the Prussian Pharmacopœia has become very popular in this country, where it is often known as "German laxative powder" and the like, and is kept regularly in stock by wholesale druggists. The formula is as follows, the number of grains of each ingredient in a spoonful (the usual dose) being added: —

	In each teaspoonful.
℞ Glycyrrhizæ pulv.	6 grains.
Sennæ pulv., ää ʒi.	6 "
Sulphuris loti	3 "
Fœniculi pulv., ää ʒss.	3 "
Sacchari albi, ʒiij.	18 " M.

Amount, 36 grains, — containing 9 grains of laxative and 27 grains of excipient, a proportion of 1 to 3.

Dr. E. T. Blackwell, in the *Philadelphia Medical Times*, criticises the prescription and recommends a modification of it, as follows: —

This prescription is faulty not only in that it is weak in laxative power, but because of the very great amount of sugar, which increases fermentation in sour stomachs, rendering it very objectionable in many cases. Its form is inexact, because an article affecting the combination as a corrigent is taken from its legitimate place, at the foot of the formula, and placed at its head. That it should give name to the medicine is absurd, for the same reason.

The British form, which omits the sulphur and fennel, perpetuates the misnomer, notwithstanding it degrades the naming article from the head of the recipe, which is here displayed for the reason already given: —

Pulv. Glycyrrhizæ Comp., Br.

	In each teaspoonful.
℞ Sennæ pulv.	8 grains.
Glycyrrhizæ pulv., ää ʒij.	8 "
Sacch. alb., ʒvi.	24 " M.

Whole amount, 40 grains, — laxative matter, 8 grains; excipient, 32 grains, or a proportion of 1 to 4.

The following scheme, in which the remedial drugs occupy the leading place and the corrigents and demulcents their appropriate relation and amount, I propose, with the name of pulvis sennæ compositus, as a substitute for the forementioned:

	In each teaspoonful.
℞ Sennæ pulv.	8 grains.
Sulphuris loti	8 "
Sacchari albi, ää ʒss	8 "
Fœniculi pulv.	4 "
Glycyrrhizæ pulv., ää ʒij.	4 " — M.

In all, 32 grains; laxative, 16 grains; excipient, 16 grains; an equal proportion.

No one will question, I think, the improvement in bringing the quantity of sulphur to equal that of the senna, which it so much surpasses as a laxative; nor does it prove less acceptable to the taste, while it is better tolerated by the stomach.

MISCELLANEA.

ALCOHOL AS A STIMULANT. — Dr. John Wilson, in his "Health and Health Resorts," remarks of alcoholic drinks as stimulants: "They are, as a rule, the most palatable; they impart gentle stimulation, and arouse the æsthetic nature as no other carbonaceous matter does. I confess they are open to the objection of endangering the formation of habits of intemperance, but in advanced cases of phthisis I have rarely known this to be the case, and I am convinced that I have seen at least many days added to the lives of such invalids by the use of these beverages without this evil consequence. By a wise law of nature, that which subserves a needful purpose rarely demoralizes, if indulged in under the stress of necessity, and in cases of rapid disintegration it would seem that the toxic effect of the alcohol is more or less lost in the process of combustion, in which its carbonaceous principle plays so important a part."

HYPNOTISM. — The *English Mechanic* says: "According to one of the 'London correspondents,' a Dr. Grützner, of Breslau, is coming to show our College of Physicians his experiments in hypnotism. It appears that at Dantzic the doctor chose fourteen boys as suitable subjects, and handed to each a copper ring in which a bit of crystal was set. These rings were to be held a certain distance from the 'root of the nose,' with the eyes fixed upon them for five minutes. 'The genuine nature of these experiments,' we are gravely assured, 'has completely overset all the medical theories hitherto propounded,' — a sentence as remarkable for perspicuity as the story is well told."

JEWISH STATISTICS. — The annual report of the Jewish Society for Propagation of the Faith in Berlin gives the following statistics of the distribution of Jews over the world: Altogether there are 6,000,000 to 7,000,000 Jews, — about as many, probably, as there were in the time of King David. Of these, 5,000,000 are in Europe, 200,000 in Asia, 80,000 in Africa, 1,000,000 to 1,500,000 in America. In Europe, Russia contains the largest number of Jews, namely, 2,621,000; Austria has 1,375,000, of whom 575,000 are in Galicia; Germany 512,000, of whom 61,000 are in Posen; Holland 70,000; England 50,000; France 49,000; Italy 35,000; Spain and Portugal 2000 to 4000; Sweden 1800; Norway 25. In Berlin live 45,000 Jews, nearly as many as in all France. In Africa, Jews are found chiefly in Algiers, but one meets with them even in Abyssinia and in the oases of the Sahara; they are often mediators between Christians and Mohammedans. In Asia, there are 20,000 Jews in India, 25,000 in Palestine. In Jerusalem there are 13,500 Jews, with 7000 Mohammedans and 5000 Christians.

TINNITUS AURIUM. — In a paper on the forms, causes, and treatment of tinnitus aurium, Dr. W. Douglas Hemming gives the following table, showing the classification of noises in the ear, together with the causes producing them: —

KIND OF NOISE.	CAUSES.
1. Tidal "to and fro" noises, like the sound produced when a shell is held to the ear.	Tobacco; chronic catarrh of the middle ear, ending in undue contraction of intrinsic muscles.
2. Humming or buzzing noises, like the sound of a humming-top or the buzzing of a bee.	Impacted cerumen, eczema, foreign bodies or parasites in the external meatus.
3. Gurgling or bubbling noises, as of air bubbling through fluid.	Fluid in either (*a*) the tympanum or (*b*) the Eustachian tube; the result of catarrh.
4. Rustling or crackling noises.	Deficiency of cerumen (hairs in the meatus or on the membrane give sounds like an æolian harp); acute catarrh in its later stages.
5. Constant rushing noises, like the falling of water in a cataract.	Venous congestion of the labyrinth.
6. Pulsating noises, often said to be like the beating of a drum; frequently synchronous with the pulse.	(*a*) Extra-aural causes, anæmia, aneurism, etc.; (*b*) arterial congestion of the labyrinth.

THE DOCTOR ON THE TRICYCLE. — In England the tricycle is recommended to country physicians, instead of a horse. A clergyman writes of his tricycle: —

"I have travelled about eight hundred miles, by this time, on pleasure trips in North Wales, and latterly in Derbyshire, on my work of deputation for the Society for the Propagation of the Gospel, and have found it a great comfort and pleasure. From seven to eight miles an hour is my speed, and I can do fifty miles per day. I can ride up any hill, almost. I carry my portmanteau with me, and carried my boy, aged twelve, behind me for thirty-four miles, once. If I were in a country place and wished to save a horse, I should do so by keeping a tricycle. It wants no grooming, no corn, no tax, no gates. You can leave it at the door of a cottage and want no one to hold it; and, better than all, it has done my health (which was shattered abroad) more good than all the physic I have swallowed, and I cordially recommend it to both clergymen and physicians."

A VENERABLE PHYSICIAN AND HUNTER. — The *Philadelphia Reporter* says that Dr. Graham, an old physician of Louisville, who is in his ninety-seventh year, has just started for the mountains on his "last hunt." He is the only living fort-born native of Kentucky. When he came into the world his parents were dodging arrows and tomahawks, and his youth was spent with a rifle in his hand. He says that he cannot die in peace until he shall once more have eaten venison of his own killing and cooking.

ANOTHER VICTIM TO TOBACCO. — A medical exchange states that Melohiah, a Choctaw princess, died at Hoyt City, in the Indian Territory, the other day, at the great age of one hundred and fourteen years. She had thirteen great-great-grandchildren. She had been addicted to the inordinate use of tobacco for one hundred and five years.

LEAD IN POSTAGE-STAMPS. — Dr. Hassall writes to the London *Times* that the new penny stamps are free from all trace of lead, but that the twopenny and halfpenny stamps contain an appreciable quantity.

SELECT FORMULÆ.

COSMETIC POMADE. — The London *Pharmaceutical Journal* gives the following formula: —

White wax	4½ oz avoird.
Lard	4½ oz. "
Balsam of Peru	60 grains.
Oil of orange flowers	30 drops.
" lavender	5 "
" cloves	6 "
" rosemary	5 "

Melt the lard, wax, and balsam, and stir them constantly until they thicken, when the oils are added. This is then poured into moulds; when cold, wrap up each stick in wax-paper and tin-foil.

Black stick pomade is made by mixing forty grains of best lamp black, carefully rubbed up with a portion of the lard.

Brown, by using burnt sienna in the same way; and various shades of brown by mixing burnt sienna with lamp-black.

GLYCEROLE OF THYMOL. — The formula is: —

R Thymol	gr. xx.
Glycerinæ,	
Alcoholis	āā f ℥i.
Aquæ destillat.	ad Oj. M.

Useful in pityriasis and, when diluted, as an effective antiseptic mouth-wash.

LIP-SALVE. — In response to an inquiry from a correspondent, we give the following recipe, which is well commended: —

Spermaceti	40 parts.
Lard, perfectly pure and fresh	80 "
White wax	20 "
Oil of sweet almonds	5 to 10 "

according to the season of the year, are melted together, the mixture colored with a sufficient quantity of alkanet, by digesting the root with the melted mass, and the latter then suitably perfumed, for instance, with

Oil bergamot	2 parts.
Oil orange	3 "

The mass is then poured out into moulds. It is customary to pour it into tin tubes, from which it is removed when cold, and then covered with tin-foil.

A PALATABLE SOLUTION OF SALICILIC ACID. — Dr. Flexner, of Louisville, recommends the following combination: —

℞ Salicilic acid	℥i–ʒviij.
Citrate of potash	℥ij.
Glycerine	℥viij.
Simple elixir q. s.	ad Oi.

The citrate of potash is to be dissolved in the glycerine by the aid of a gentle heat, after which the acid is to be stirred in and a gentle heat maintained until it is completely dissolved. On cooling simple elixir is to be added to bring it up to the required measurement, after which the solution is to be strained. It contains five grains of salicilic acid to the drachm, and is miscible in all proportions with water without the separation of any acid.

FOR BURNS. — Dr. E. H. Travel, in the *Southern Clinic* for September, 1880, recommends the following formula as an application in burns: —

℞ Acidi carbolici (cryst.)	3 iij.
Olei olivæ opt.,	
Glycerinæ,	
Aquæ fontis	āā 3 v. M.

Shake well before using, and keep a linen cloth saturated with the solution and applied to the burned surface.

GOLD MEDAL COLOGNE. — According to the London *Chemist and Druggist*, the following is the receipt that won the gold medal at the late Sydney Exhibition: —

Oil of bergamot	7 parts.
Oil of citron (cédrat)	17 "
Oil of neroli, petale	10 "
Oil of neroli, bigarade	3.5 "
Oil of rosemary	7 "
Wine alcohol	3000 "

The wine alcohol may be replaced with the spirit known here as Cologne alcohol.

FACETIÆ.

JOHANNES CABALLUS, M. D. — Bogus diplomas are no modern idea. That they were known in the olden time, and that the infamous Philadelphia concern was not without precedent, would seem probable from the following anecdote of Rabelais: In his time (in the early part of the sixteenth century), the old University of Montpellier was reputed to be given to the crooked ways of Buchanan. It sold diplomas extensively, in many instances even dispensing with the presence of the buyer. Rabelais, satirist that he was, as well as physician and philosopher, played a practical joke on the venerable faculty. He addressed them a formal application, on behalf of a young friend, dwelling on his profound learning and wonderful skill in medicine. Enclosing the customary fee, he ended with the request that the degree of M. D. be conferred on this friend, whose name was Johannes Caballus. In due course of time the precious sheepskin arrived; but the rage of the faculty may be better imagined than expressed when the report reached them that they had made a jackass a doctor, — M. Johannes Caballus being none other than Rabelais's favorite jackass.

THE DOCTOR'S RECREATIONS. — "Every doctor," says Prof. L. P. Yandell, "should paint, or sculpture, or etch, or geologize, or botanize, or hunt, or fish;" on which dictum the *Review of Medicine* comments facetiously thus: "Lest any doctor should hesitate which of these harmless recreations to occupy himself with, we suggest that he adopt all seven of them, devoting a day to each. This would bring painting on Mondays, sculpture on Tuesdays, and so on; fishing, of course, being very properly left for Sundays. The idea is so excellent that, as with all sensible suggestions, we wonder nobody ever thought of it before."

THE APOSTATE'S CREED. — Under this title the *Independent* gives the following hit at a certain class of "evolutionist" philosophers: —

I believe in a chaotic nebula, self-existent, evolver of heaven and earth, and in the differentiation of the original homogeneous mass, its first-begotten product, which was self-formed into separate worlds, divided into land and water, self-organized into plants and animals, reproduced into like species, further developed into higher orders, and ultimately refined, rationalized, and perfected in man. He descended from the monkey, ascended to the philosopher, and sitteth down in the rights and customs of civilization under the laws of a developing sociology. From thence he shall come again by the disintegration of the heterogenized cosmos back to the original homogeneousness of chaos.

I believe in the wholly impersonal absolute, the wholly uncatholic church, the disunion of the saints, the survival of the fittest, the persistence of force, the dispersion of the body, and in death everlasting.

WARBURG OF "TINCTURE" FAME. — The *Pharmacist* says: "Dr. Carus Warburg, the author of 'Warburg's Tincture,' is said to be old and destitute, on which account many of our medical exchanges are exceedingly lachrymose. For our part, while we sympathize with suffering, we cannot forget that this man inflicted on the medical profession one of the most villainous, shot-gun prescriptions of our era. Many good folks believe that retribution is not always exclusively reserved for the nether world."

DISCRETION THE BETTER PART, ETC. — A very contradictory old Scotch lady was observed to be ready enough to assent to any remarks which were made to her by her dentist, when she had occasion to visit him. Her exceptional behavior was commented on. "What would you have?" was, dropping the vernacular, the purport of her reply; "when I am going to put my head into the man's hands I think it best to speak him fair!"

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PARIS, ILLS. *January* 27, 1880.

HORSFORD'S ACID PHOSPHATE IN HEADACHE. — I used the sample of Acid Phosphate, and have prescribed it several times. In certain forms of headache, it seems to act as a specific. A friend of mine took a bottle with her on a Niagara excursion, last summer, she being subject to headache from riding on the railroad. She gave it to several of the company who had headache, to their great relief.

No doubt it is valuable in many forms of dyspepsia also.

J. L. HAYS, M. D.

THE CROCKER REVERSIBLE FILTER CO. are manufacturing a very superior and improved Water Filter, which is highly recommended. See advertisement on page 8.

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BOOK PURCHASING AGENCY. — The attention of our readers is called to the advertisement of the above in our advertising columns. Parties requiring books of any description will find our agency a very great convenience, as books ordered will be sent free of charge by remitting us the publishers' price.

PROF. CURT W. MEYER, of No. 182 Broadway, New York, presents for the holiday season a very perfect set of electrical instruments. In a convenient box may be found a compact electrical plate machine, perfectly capable of generating electricity, with electrical orrery, cannon, bells, ball, electrometer, Leyden jar, head of Medusa, and a Geissler or vacuum tube, with other apparatus. Now, all these various objects are contained in a box not more than a foot square, and can be sold at the same cost as many a useless toy. This electrical machine answers perfectly for all class experiments. The philosophical instrument maker of to day is not required to turn out ponderous machine for purposes of public instruction. A class is much more impressed when science is taught them by means of simple instruments. This robs science of half its mystery. All the wonderful progress electricity, magnetism, and optics have made is due to the adoption of the plainest, the most inexpensive machines. Prof. Meyer by his inventions has endeavored to present to parents and teachers apparatus explanatory of science which can be sold at low cost. His great desire, then, is to arouse a general love of scientific study, and as it is quite certain that all the needful facts and principles may be produced with simple appliances, young people, and even old ones, can then be brought into contact with actual experimental demonstrations.

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FOR the past twenty years this preparation has been more favorably received by the profession than any of the "Iron and Bark" combinations introduced during that time. One of its peculiar merits is the association of a *proto-salt* of iron with the valuable alkaloids of Peruvian bark, in an elegant and permanent form. Many imitations have been put into the market, but no one of them attains this important result of the perfect combination of the Protoxide of Iron with all the active principles of the bark.

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Familiar Science.

COMFORT FOR THE SLEEPLESS.

VERY many of those whose attention is called to the title of this paper will exclaim, "How can there be any *comfort* for the worn, jaded, hopeless invalid who is suffering from persistent insomnia?" It is the design of this article to show what methods of treatment and mental discipline have been found most effective in ameliorating the evil, and consequently in affording comfort to the suffering ones. The number of those of both sexes and all ages and all pursuits in life who are troubled with insomnia is very great, and the number is supposed to be increasing rather than diminishing. It has been regarded by some writers as comparatively a new affection, and due in a great measure to effeminacy in habits of life and modes of living. We do not attach much importance to this view, for the very good reason that there is no substantial basis of facts for it to rest upon. So long ago as we can remember, — and the space of time over which our memory extends is more than half a century, — the number of the nervous and the sleepless, compared with that of people then existing, was as great as now, and the increase is the result of increased population. The truth is, the make-up of people who stood to us in the relationship of grandfathers and grandmothers, or great-grandfathers and great-grandmothers, was about the same as now, and the same idiosyncrasies of organization existed among them as exist among us. They dosed for nervous pains and restlessness as we do; but the nature of their remedies was very different. Instead of morphine, the bromides, chloral, etc., they took to onion syrup, lettuce juice, assafœtida, and a decoction of valerian roots; and in the list we must not forget to place that famous "lethean head-support," the hop pillow. Instances of weak or disordered nerves were observed among the Indian tribes in the early settlement of the country; and among all nations, civilized and savage, there are physical organizations not favorable for quiet and repose under abnormal conditions, or change of circumstances.

Nature, for the best of reasons, doubtless, has given to some good digestion, a sound muscular system, and an arrangement of nerves which is insensible to outward or inward influences. The men and women who can say in truth that they never have known they had a stomach or a nervous system, from any physical pains, are looked upon with envy by the dyspeptic and nervous. This feeling is unavoidable, a natural result of contrast between persistent misery and a supposed exemption on the part of those whom they see around them. But we must remember that the law of compensation holds good in every movement in nature, in every phase of life. The unemotional do not, in many instances, rise much higher in the scale of being than the animals, — not, in fact, as high as in the case of some animals. The animals, both savage and domestic, eat, drink, and die; and what more can be said of men and women who all their lives eat, sleep, and lounge about, like pigs or oxen in the fattening stalls of the farmers? If rich, they enjoy a good dinner, a nap afterwards, a ride in an easy carriage, a few friends without culture, like themselves; but the beautiful things in nature and art, like flowers, landscapes, mountains, cascades, paintings, statuary, music, oratory, books, — these are not according to their tastes, and are ignored. The sufferers from sensitive nerves, intense emotion, insomnia, etc., are usually of an organization susceptible to the influence of the beautiful, lovers of everything that is refined, and they enter into keen enjoyment of whatever is wonderful or elevating in nature and art. Shut out as they are from the animal pleasures of the world, the higher joys of a purer sense afford keen delights when pain and suffering are absent from the body. Is there not comfort in these considerations? Everything that is good and holy in this world comes through suffering, and where there is much of this there are open to sufferers sources of bliss of which the healthful, stolid, animal human world can know nothing whatever. But let us turn to sources of comfort of another kind, namely, hygienic and remedial measures adapted to remove in a degree the intensity of suffering, and thus confer seasons of happiness upon the sleepless. Insomnia arises from a variety of causes; largely, however, from inherited weakness of organization, from habit, from bad practices in both sexes, from too much worry or attention to study, from too much business and business care, from local physical troubles, and from many other less prominent causes.

Having been a sufferer from insomnia for more than thirty years, we have naturally had our attention turned to its study, and have given it much thought and observation. In our case it arises from inheritance in a large degree, or rather from the effects of incessant mental labor upon an inherited feeble constitution. We have sounded to the bottom all the depths of misery attendant upon sleeplessness, and our sympathy for this class of sufferers is very great. Notwithstanding the suffering, life has not been devoid of comforts and pleasures; and to know how to extract good out of evil, or how to rise superior to physical pain, is knowledge of a desirable kind.

Insomnia is not troublesome alone to the weak and nervous. Some of the worst instances that have come under our notice have been in the case of men of strong, wiry constitutions, — men who have done their full share of the world's work and reached to good old age. Habit has much to do in originating the evil in such instances. Any man who goes to bed with his business on his mind, or with some kind of worry, great or small as it may be, is in the way of acquiring habits of wakefulness. The habit once established, like the appetite for drink, or tobacco, or rich foods, clings tenaciously to one, and it is recognized with alarm that the evil has come to stay. Men and women not of excitable temperaments become sleepless from over labor, mental or physical, or from both combined. Such cases yield readily to proper diet and rest. Often, persons who all their lives have uniformly slept well are suddenly and without known cause attacked with insomnia. One night goes by without sleep, still another, and perhaps another, and then comes a state of mental fear and unrest which is deplorable. The patient is frightened; it is a new experience; there is fear that sleep will never come again; and, to the disordered imagination, insanity is imminent, the asylum looms in the distance, every sense is abnormal; wild fright usurps the place of reason. We have had such cases brought to us for advice, and the satisfaction experienced in being able to dispel fear and remove the abnormal conditions has been very great. In one instance a gentleman came from a long distance in a deplorable condition of mind. He was soothed and quieted with the assurance that his case was by no means unusual, that he would sleep again, that he need have no apprehensions, etc. This man took his carriage for his return, and slept soundly the whole distance. In such cases there is much alarm among the attendants or family, and this adds to the excitement of the patient. Prompt advice is necessary here, before a habit of wakefulness is established. Lawyers, after an exciting week in court; clergymen, from the excessive labors of Sunday; literary men, at the close of work upon a book or essay, are apt to pass sleepless nights, and this abnormal condition must receive immediate attention: a temporary change

of thought and labor is demanded, so that the distended blood-vessels of the brain may retract to their normal state. Inattention may result in laying the foundation of a miserable life; and this is true in the case of the strongest physical constitutions.

In instances of sleeplessness, fear and distrust are usually the most prominent and distressing symptoms. The ever-present feeling is that sleep has departed never to return; and this is the disturbing emotion even in those who have had repeated attacks of the evil. Nothing is gained from experience: loss of sleep for two or three consecutive nights renders everything within and without abnormal; past deliverances are forgotten; hope departs, and gloom usurps its place. At this juncture the kind assurances of friends, the little attentions and soothing words of a sensible husband, wife, sister, or brother, fall like the holy ministrations of angels upon the disturbed spirit of the sufferer, and afford comfort which is unattainable from other sources. As a remedial agent nothing seems to be more appropriate and effective in such cases than the bromide of sodium combined with bromide of ammonium. We have found twenty-five grains of the former mixed with ten of the latter, dissolved in a large wineglass of water, to which has been added ten drops of fluid extract of ginger, a most excellent remedy. It should be made ready early in the afternoon, and taken in three or four doses at regular intervals until bed-time. We much prefer the sodium bromide to the potassium; and the ammonium is to jaded dyspeptic stomachs a tonic as well as a soporific.

In all cases of sleeplessness from worry, or where this tendency is constitutional, hydrate of chloral is the royal remedy. We regard this agent as the most wonderful in its specific influence and adaptations of any known to medical science. Its discovery is among the most important ever made in chemistry, and the name of Liebreich, the discoverer, cannot fail to be remembered through all the ages. Look at some of its remarkable characteristics: (1) it rarely fails to produce quiet, refreshing sleep; (2) it seldom disturbs the stomach; (3) it increases the appetite; (4) it does not disturb the bowels; (5) it does not lose its power by continued use, and the dose does not need to be increased. The prejudice against its proper employment is not based on knowledge of its remedial or chemical nature. Like all good things, it is liable in ignorant hands to cause some degree of mischief, but less than most other powerful agents. It is not a remedy to be placed in the hands of patients for indiscriminate employment, and the same may be said of all medicines. To the sleepless, chloral is a boon of the greatest magnitude, but the *habit* of taking it must be guarded against. If one is troubled with persistent insomnia, it is important to secure a good night's rest as often as once each week, and the chloral may be taken once or twice a week without the slightest danger, unless there are some very unusual complications. Of course it should be taken only under the supervision of an intelligent physician.

Sleeplessness is not often a fatal affection. Hundreds and thousands are tossing upon their beds sleepless, discouraged, weary, in all parts of the world, every night, and most of the sufferers live through the usual number of years allotted to man. We have counted the shingles upon the roofs of imaginary dwellings, and numerous flocks of sheep as they jumped, one by one, over an imaginary wall in a pasture, through hundreds of weary nights, but sleep has not yet taken its final departure, and probably will not until the physical house we live in is entirely vacated. Let no sleepless person be discouraged. Maintain hope under all circumstances. Remember that there are many worse cases of suffering than your own in the world, although to you it seems impossible. Keep up your general health by all sanitary means possible; walk much in the open air, if you can walk; ride, if you cannot walk. Above all measures, keep the functions of the skin in prime condition; cleanliness is antagonistic to sleeplessness. Dry friction over the body by the use of the hand, or better by the use of the French hair mitten, twice a day, we have found of great service. The air bath should not be neglected. A few minutes after the employment of friction over the body, walk about without clothing in a cool room, and if possible let the sun strike upon the body. Do not remain uncovered too long, so as to become chilled. Keep the digestion good; eat only such forms of food as suit the digestive organs. Surround yourself with cheerful company if possible, read such books as do not tax or weary the mind, and life will cease to be a burden, even if you do not sleep as others do. Avoid above all things constant dosing; throw into the ditch, or into the sea, all nostrums that may fall into your hands. A little of the bromides or chloral may be needful at times, but use them only as directed by physicians.

FROSTWORK.

Cold is of course as veritable a nonentity as the mythical Jack Frost who is its popular personification. It is simply an expression for the absence of heat, or rather for a low degree of heat. But it is a convenient designation for such temperatures, and, as a form of heat, may be familiarly spoken of as a force. Even scientific writers have referred to "fire and frost" as antagonistic workers in producing geological changes. Antagonists they often are, though really different phases of one and the same great force.

The term *frostwork*, in its most literal sense, suggests the exquisite tracery with which we find our window-panes ornamented on a winter morning, — the "silvery mosses" and "quaint arabesques of ice-fern leaf" that mimic the most delicate of plant-forms, and make a miniature "winter garden" of crystalline vegetation. The beauty of this fine translucent growth is due to its crystalline structure, or the tendency of water in freezing to build its molecules into regular geometric forms, all based upon the angle of 60 degrees. As the particles assume the solid state they do not huddle together promiscuously, but polar forces come into play, causing them to take certain definite positions, and thus to produce masses of regular shape.

It is this directive force of the atomic poles regulating the attraction of the atoms towards each other that gives rise to the beautiful forms seen in snow-crystals, all of which are modifications of the six-pointed star, — the angles between the rays being 60 degrees each, or one sixth of a circle. They are best observed when the snow is falling on a calm day, and if caught on a dark surface — black cloth, for instance — may be examined with the naked eye, though better with a magnifying glass. Their figure is generally uniform in the same fall of snow, but often varies in different falls. If you make drawings of specimens from every snow-storm of the season, you will have a lovely collection of these crystalline shapes, all variations of the primary stellar type.

But ordinary ice, you will say, is not of this crystalline character, but a shapeless mass. It seems so, indeed, at first glance, but it is really built on the same structural pattern as the snow-flake. When water freezes slowly, six-pointed stars may occasionally be seen forming and floating freely on the surface. Tyndall was, we believe, the first to observe this phenomenon; but he has directed attention to another means of demonstrating the crystalline nature of ice, which is better suited to the purposes of experimental illustration. If a concentrated sunbeam is sent through a slab of ice, the latter is partially melted, but the liquefaction occurs in spots, producing what appear to be transparent six-petalled flowers with a shining spot in the centre. The petals of the flower are water, which occupies less space than the ice before it was melted, and the bright centre is due to the resulting vacuum, the surfaces surrounding which reflect light to the eye. These flowers are always parallel to the surface of the ice, and are formed whenever the sun shines upon it, though often so small as to require a magnifying glass to see them, and often marred by internal defects in the ice. One may sometimes obtain them in a clear piece of ice by means of a common "burning-glass" or pocket lens. The experiment is easily tried, and if successful will be a surprise and a delight to the observer. The structure of the ice is thus proved to be crystalline, because it is evident that the sunbeam, as Tyndall expresses it, "is delicate enough to take the molecules down without deranging the order of their architecture."

Reference was just made to the familiar fact that ice occupies more space than the water before it was frozen. It is well known that water is an exception to the general law that liquids contract with cold until they congeal or solidify. It contracts until it is cooled down to 39° F., and then it expands slowly until it reaches 32°, when it solidifies with a sudden increase of expansion which, as we are aware, exerts an almost irresistible force against any barrier that confines it. Certain melted metals and alloys expand in a similar manner at the moment of solidification. This is the case with iron, and more strikingly with bismuth and its alloys; a property which is of practical value in giving sharpness to castings made from them. The expansion is undoubtedly due to the rearrangement of the molecules which takes place in the process of crystallization. Under the influence of the polar forces the particles are somehow turned about and grouped in such a way that they require more space, and the energy with which these forces act is powerful enough to overcome enormous resistance. Half a gill of water frozen in a confined space will lift a weight of several tons. Some of our readers

may have had disagreeable evidence of this expansive force in ruptured water-pipes during the recent zero weather. It often does mischief, but is sometimes made to do useful work. In some of the slate quarries in England it has been utilized in splitting up large blocks of the stone into the thin plates of which they are composed. The blocks are placed with their edges upwards, where the rain will fall upon them. The water works its way between the layers, freezes, and forces them apart.

This rock-splitting is a kind of work that has been done on a vast scale in nature. The soil of the globe has been largely produced by the freezing of water in the cracks and crevices of the rocks. Mountains have thus been rent asunder and pulverized, and the process goes on every winter. And after the soil has been formed it is broken up and rendered friable by the alternate action of frosts and thaws, which prove efficient auxiliaries to the ploughman and the farmer.

The phenomena of glaciers have been so fully described and explained in former volumes of the JOURNAL that we need only remind the reader of the part these wonderful rivers of ice have played in tearing down the hills and filling up the valleys. They are mills of God that "grind slow but exceeding fine," and by their sluggish but irresistible motion they are gradually altering the face of large portions of the globe, as they did on a far grander scale in the "glacial epoch" of its history.

Our subject has led us from the delicate frostwork on a window-pane to the work done by the same agency of ice in sculpturing the rocky face of the great globe itself, and yet we have but lightly touched a few points out of many that the theme suggests. To do full justice to it in all its details would require a volume.

THE PLANET JUPITER.

JUPITER has always been an object of peculiar interest to astronomers. The remarkable belts that mark his surface undergo changes showing that they must be atmospheric phenomena of a most stupendous character, and they have been watched by telescopic eyes for centuries. But recently certain spots of extraordinary size and diversity of color have appeared on the Jovian disk, and have attracted more than usual attention to the planet. The great "red spot" has proved more permanent than any other "marking" observed for many years; and other spots no less striking have come into view more recently and are still visible. Next to their permanence the most curious thing about these spots is that they have motions independent of the rotation of the planet, but with varying velocities, some gaining one rotation in thirty-two days, others in seventy-three days, and so on. What this means we cannot at present understand. The phenomena are too novel for hasty theorizing, but continued observations may furnish a clue to their real nature.

The *London Telegraph* is disposed to treat the subject facetiously, and comments on the planet's "new departure" as follows: —

If we may credit the astronomers, Jupiter is once more behaving in a highly mysterious and reprehensible manner. So long as he confined himself to exhibiting one unsightly red spot upon his face, no one complained very bitterly. It was generally hoped that, in course of time, this much-respected orb would see the error of his ways, and cease to assume the appearance of an inebriated planet. Sad to relate, however, he has gone from bad to worse, and is just now showing, side by side with the red spot complained of, a number of white ones, which give to his countenance an appearance truly sad to behold. No wonder that quiet, staid astronomers, who, as all the world knows, are most averse to joking, stand aghast at such an exhibition. For many years Jupiter has held a deservedly high place in their estimation, and they had come to regard him as a globe of such regular habits that he might be depended upon in any emergency. They had long ago declared him to be as "cool as a cucumber," and were half inclined to allot both atmosphere and inhabitants to him, when he breaks out in this unexpected way. All their calculations are consequently upset. He may be in a boiling heat for all we know, a deceptive planet who has attempted to look calm and cold while all the time he has been in a state of furious conflagration. This teaches astronomers to be chary in future of giving a good character to any heavenly body. If Jupiter be so bad as this, what may be expected of stars that have no reputation to lose?

ELECTRIC SPARKS.

THE EARLY DAYS OF MORSE'S TELEGRAPH. — Professor Trowbridge, in an article on "Practical Science," remarks: It seems incredible, from our present stand-point, that so short time ago, in our congressional halls, the electric telegraph was almost ridiculed and voted into oblivion, from which it could never rise. When a bill was presented appropriating $30,000, to be expended under the direction of the postmaster-general, in a series of experiments to test the merits of Morse's electro-magnetic telegraph, one member moved an amendment requiring half the appropriation to be used for the encouragement of mesmerism. Another proposed to include Millerism in the benefits of the appropriation; others to appropriate part of the sum to a telegraph to the moon. And when the bill came to a final vote, this was so close that a change of three votes would doubtless have left us till this day without the benefits of the telegraph. After his invention was in working order, and transmitting messages between Baltimore and Washington, Mr. Morse offered it to Congress, to be attached to the post-office department, for the sum of $100,000. But it was declined, on the statement of the postmaster-general, who reported that, while the invention was "an agent vastly superior to any other ever devised by the genius of man," he was not satisfied that "under any rate of postage that could be adopted its revenue could be made to equal its expenditures." By this short-sighted want of appreciation of science, the United States government deprived itself of a source of revenue sufficient, doubtless, to liquidate the entire national debt in a single decade.

AN ELECTRICAL BLOWPIPE. — The electrical blowpipe of M. Jamin consists of a pair of carbon pencils — an electric candle, in fact — surrounded by a coil of insulated copper wire wound a few inches distant from the pencils in the plane of their axes. The current is so led that, in circulating round the coil, it will attract the electric arc formed at the lower end of the carbon pencils, and cause it to flash out almost in the form of a fish-tail gas flame. This spreading out of the arc is the special feature of the action of the apparatus. It facilitates the application of the heat of the electric arc to the fusion of refractory substances, and enables us better to take advantage of this little-used means of producing a very high temperature.

THE CARBONS IN SWAN'S ELECTRIC LAMP. — The London *Electrician* says that the mystery of Mr. Swan's carbons is at length disclosed. They are made of vegetable parchment, — commonly called parchment paper, — cut into strips, and carbonized; they are then bent to the required shape and fixed inside the exhausted globes in the manner publicly described by Mr. Swan. The so-called vegetable parchment is paper prepared with sulphuric acid, whereby it becomes exceedingly tough and compact.

SCIENTIFIC BREVITIES.

AN INGENIOUS PIECE OF APPARATUS. — *La Nature* describes a contrivance devised by M. Mocenigo for demonstration of various laws of mechanics. This consists of a small piece of railway (on supports) bending upwards, on which a little four-wheeled chariot runs to and fro. The oscillations would, unaided, diminish and cease; but they are continued by means of the following device: At each end of the path is placed a cylindrical reservoir containing heavy balls of lead or iron, and these move down a helicoidal groove under the reservoir to a kind of spout. The chariot, reaching one end of its course, acts on a small lever, which admits one ball, and one only, into a little cup (one of two) carried by it. On reaching the middle of the path this ball falls out to the floor. The chariot rises on the other side, and receives a ball into the other cup, and so on. It will thus be understood that the movement can be kept up indefinitely, so long as balls are provided by the reservoirs. The apparatus is well adapted to illustrate the laws of fall of bodies, the work of friction, the expression of work, the equivalence between work expended and work produced in machines, etc.

PERFUMERY AND FLOWERS. — It is a curious fact that some of our sweetest flowers are unavailable for the purpose of perfumery. Sweet-brier, for instance, and eglantine can only be imitated. No process has yet been discovered by which their delicate perfume can be extracted and preserved; spirituous extracts of rose pomade, of flower of orange, neroli oil, — also produced from orange and verbena, — when cunningly combined, very fairly imitate both. Lily of the valley — another useless flower to the perfumer, though of exquisite scent in itself — is marvellously imitated by a compound of vanilla, extract of tuberose, jasmine, and otte of almonds. Almost all lilies are found too powerful even for perfumery purposes, and are therefore little used, even in combination with other odors, for it has been found in many instances that they do not harmonize well with the "fixing and disguising" scents in general use.

FOOD VALUE OF VARIOUS SUBSTANCES. — Professor W. O. Atwater, in an essay on the nutritive value of fish, gives the following table: Taking medium beef at 100, we have, as the nutritive value of like weights of fish free from bone: medium beef, 100; fresh milk, 23.8; skimmed milk, 18.5; butter, 124.0; cheese, 155.00; hen's eggs, 72.0; codfish, fresh, 68.0; flounders, 65.0; halibut, 88.0; striped bass, 79.0; mackerel, 86.0; lake trout, 91.0; eels, 95.0; shad, 99.0; salmon, 104.0; salt mackerel, 111.0, dried codfish, 346.0.

CARBONIC ACID IN PLANTS. — Experiments have been made by M. Cauret upon the development of carbonic acid by the roots of plants, and the results are reported in the *Bulletin* of the French Botanical Society. The natural conditions were imitated as closely as possible. The conclusions are as follows: (1.) Roots constantly develop carbonic acid. (2.) The development is less by night than by day. (3.) It increases at sunrise, decreases about midday, and rises again in the evening. (4.) The development in any period of the day is greater than in the corresponding one of the night.

HUXLEY ON "APPLIED SCIENCE." — Professor Huxley recently remarked: "I often wish that this phrase had never been invented, for it suggests that there is a sort of scientific knowledge of direct practical use which can be studied apart from another sort of scientific knowledge which is of no practical utility, and which is termed 'pure science.' But there is no more complete fallacy than this. What people call applied science is nothing but the application of pure science to particular classes of problems."

LUMINOUS PAINT IN CHINA. — According to a foreign journal, a "Chinese-Japanese encyclopædia," in an article on painting, states that a certain Su Ngoh possessed a *painted* ox which left its frame every morning to go grazing, and returned to its frame at night to sleep there. The picture came into the possession of Emperor Tai Tsung, of the Sung dynasty (976–998 A. D), who showed it to his courtiers and demanded from them an explanation, which no one could give. Finally a Buddhist priest stated that the Japanese found a luminous substance in a species of oyster (Canton's phosphorus was formerly prepared by heating together oyster-shells and sulphur), which they collected and mixed with paint so that it was invisible by day and only visible at night. The author of the encyclopædia adds that the picture of the ox was doubtlessly painted with such a paint.

HOUSEHOLD HINTS.

SAND BAG FOR THE SICK-ROOM. — One of the most convenient articles to be used in a sick-room is a sand bag. Get some clean, fine sand, dry it thoroughly in a kettle on the stove; make a bag about eight inches square of flannel, fill it with the dry sand, sew the opening carefully together, and cover the bag with cotton or linen cloth. This will prevent the sand from sifting out, and will also enable you to heat the bag quickly by placing it in the oven, or even on top of the stove. After once using this you will never again attempt to warm the feet or hands of a sick person with a bottle of hot water or a brick. The sand holds the heat a long time, and the bag can be tucked up to the back without hurting the invalid. It is a good plan to make two or three of the bags and keep them ready for use.

FOREIGN BODIES IN THE EAR. — Dr. Burnett, in his excellent little "Primer," entitled "Hearing and How to Keep it," remarks: "It may be said, for the comfort of friends and parents, that no bead, button, 'spit-ball,' bean, grain of wheat or maize, or any similar small object which a child could put into his ear, will do any harm, *if let alone* by all save one entirely conversant with the structure of the ear, and properly supplied with instruments for examination and treatment. If your child, therefore, gets any such foreign matter in its ear, rest assured such object has not gone beyond the reach of surgical skill. The harm in such cases *usually* arises from the unskilful means resorted to, in haste and consternation, for its removal. Let it alone until it can be properly removed."

TO PROTECT WOODEN VESSELS AGAINST MOISTURE. — In order to prevent the rapid deterioration of wooden vessels when exposed to moisture, they may be thoroughly dried and then painted with two or three coats of a solution of paraffine in benzole. If the vessels are to be subsequently exposed to heat, a final coating of linseed oil varnish, or soluble glass should be given. If soluble glass is used, the vessel should be subsequently washed with dilute hydrochloric acid.

ONIONS IN CONSUMPTION.—Dr. W. H. Pearse, physician to the Plymouth (Eng.) Public Dispensary, recommends the free use of onions for consumptive patients. He says: "I have in a former paper mentioned the frequent desire of phthisical patients for onions, salted and smoked fish, etc. Of those asked, forty had a great desire for onions against eight without such desire. Twenty-six desired pickles and vinegar against four who did not. I cannot avoid again remarking on the frequency with which onions are debarred young delicate people and phthisical patients. It is a continually recurring experience with me to hear young people say how great is their desire for onions, which are often preferred raw, eaten with a little salt; and it is rarely that I have heard that onions disagree. I conceive that it is of the greatest importance to follow Nature's lead in the matter of the appetite. . . . I conceive, further, that a marked passion for a special food, such as that of the phthisical for onions, puts us on a right path toward further knowledge."

CURING HAMS. — The *Live Stock Journal* asserts that hams have a decidedly better flavor, and the meat retains a more natural color, when nothing but plain salt is used in the curing. If the work of salting is carefully attended to, the hams, when cured with salt alone, will be ready for smoking at from six weeks to two months, according to the size of the hams. Saltpetre has a tendency to harden and redden the meat. It undoubtedly hastens the curing process; but it does so at the expense of the flavor.

Practical Chemistry and the Arts.

NEW WORK FOR THE GREAT EASTERN.

THE largest of ships has always found it difficult to get remunerative employment, and has been a costly elephant on the hands of her owners. For several years she has been lying idle in Milford Haven, one of the few British harbors which she can enter; but now, as we learn from foreign journals, she is to be once more made available for her original purpose, — that of carrying passengers or cargo on a grand scale. It is said that she has been chartered for the transportation of "dead meat" from this country or from South America to England. It is calculated that from Texas or the Argentine Republic beef of prime quality can be laid down in England at six cents a pound. The promoters of this bold scheme intend to slaughter the cattle on board the great ship as received from day to day, and for this purpose they have secured the services of trained butchers from the slaughter-houses of Chicago. The dressed meat will be stored in refrigerators, and it is estimated that 10,000 to 15,000 carcasses of beef, all hung, — equal to 3000 or 4000 tons of meat, — will be shipped each voyage.

Our London contemporary, *Iron*, commenting on the plan, remarks: —

The result of this enterprise, if successful, will have a far wider bearing than appears at first sight. It will be watched with much interest by the public, no doubt, for, notwithstanding the large imports of fresh meat we are receiving, retail prices still rule very high. But it will also break down that "ring" which, while reaping immense profits, keeps almost at famine prices one of the first food requisites of the people. We wish the enterprise hearty success, for, if once its practicability has been demonstrated, it will lead to the construction of other Great Easterns, and the inexhaustible supplies of meat of the American continent, once properly tapped, will continue to flow in an uninterrupted stream, to the discomfiture of an unnatural combination, but to the great benefit of all classes of this country.

ALVAN CLARK AND SONS' TELESCOPES.

OUR Cambridge telescope-makers, Alvan Clark and Sons, have now in hand an unusual number of large telescopes, to say nothing of smaller ones. A correspondent of *Science* gives the following particulars: —

The lenses of the 23-inch equatorial for Professor Young, at Princeton, are receiving the finishing touches, and have already shown a remarkable degree of perfection. The glass was cast by Feil. The mounting for this instrument is well advanced.

A 16-inch objective for Professor Swift, of the Warner Observatory, is finished, and the mounting nearly so. This glass is of English manufacture.

The McCormick glass of 26 inches aperture, made at the same time as the Washington Refractor, and intended for the University of Virginia, is still in the shop and has been completed for several years, while the mounting requires but comparatively little additional work.

Two 8-inch refractors have been ordered and are partially finished, — one ordered by Professor Young for the seminary at South Hadley, and the other by Dr. Engelmann, of Leipsic.

The flint glass disc for the 30-inch telescope, ordered by Struve for the Russian Government, has been received from Feil, and the crown glass is expected shortly. The mounting for this will probably be made abroad.

For the Lick Trustees a 36-inch refractor is ordered, but will not be completed for several years.

A 12-inch equatorial for observing the transit of Venus is nearly finished, and orders have been received for a 5-inch photoheliograph and a smaller comet-seeker.

In all or nearly all of these instruments the cell of the object glass is arranged so as to separate the lenses by several inches and allow a free circulation of air between them, as well as to afford an opportunity of readily reaching the inner surfaces of the glass. In the larger objectives especially, such a device is required in order to bring the temperature of the glass as nearly as possible equal to that of the external air.

INDUSTRIAL MEMORANDA.

PAPER CAR WHEELS. — How these are made is thus explained in the *Paper World*: "The paper is straw-board of rather fine texture. It is received in the ordinary broad sheets, differing in no particular from those used for straw-board boxes or other similar work. These sheets as they come from the paper mill are square, and are first cut to a circular pattern. This is done on a table with a knife guided by a radial arm. A small disc is also cut from the centre of the sheet to admit the wheel centre. The paper has now to be converted from loose sheets into a compact, dense body, capable of withstanding the tremendous crushing force to which it will be subjected in the wheels. This is accomplished as follows: Ten sheets are pasted together, one upon another, making a disc about $\frac{1}{8}$ in. thick. Enough of these discs having been prepared to fill a powerful hydraulic press, they are subjected to a pressure of 1800 lbs. per square inch. When removed the discs are hung on poles in a steam-heated loft and left six days to dry. Thicker discs are then made, each formed by pasting together two or three of those already finished. These are pressed and dried as before, and the process is repeated until a block is built 4 in. thick and of about the specific gravity of lignum vitæ. After each pasting and pressing, six days are allowed for drying, and when the block is complete it is left in a drying room until thoroughly seasoned. The next operation is that of turning the paper blocks to fit the steel tires and iron centres. This is done in lathes in the same manner as if the material worked on was tough wood.

A bed or recess is worked out for the web of the tire to rest in. The block is then painted, and is ready for its place in the wheel."

AN ENGLISH ENGINEER ON AMERICAN LOCOMOTIVES. — Mr. R. M. Brereton, C. E., writing on this subject, says: "I argue that the greater duty done by the American motor is due to the better design and the better system of working the locomotives. The American builder excels in the system of framing and counter-balancing, and in the designs of crank axles, etc., so that the engine may run remarkably easy and without jar round sharp curves, and work not only the light roads, but also diminish the wear and tear on the solid roads, and at the same time increase the effective tractive force. The English engine is a very heavy affair, and in running it not only wears and tears itself very rapidly, but also the roadway, and by its unsteadiness and jar it greatly fatigues the drivers and firemen. I have ridden hundreds of miles on engines in India, in England, in France, and in the United States, and I have always found the American engine most easy and comfortable; but I never did the English or the Continental engines. It is almost impossible to give these engines their full hauling power, simply because the greater portion of the weight cannot be thrown on the driving wheels."

THE MOST POWERFUL DERRICK IN THE WORLD. — The colossal "crane" (or derrick, as we Yankees would call it) which has been in process of construction for four years at the Royal Arsenal, Woolwich, England, is now nearly completed. The size of the thing may be inferred from the fact that more than 1800 tons of iron have been used in making it, while the brass bearings alone amount to more than three tons. When completed, the crane will be capable of lifting three or four 100-ton guns at once; but the purpose for which it has been provided is not to do work which other appliances could accomplish in detail, but rather to meet the probable necessity for dealing with specimens of ordnance so enormous as to defy all the means at present available for mounting them in their carriages. The motive power will be steam. Although calculated to raise 1200 tons in case of need, the apparatus will also be fixed for raising small weights at accelerated speed, and it is anticipated that, even in the ordinary daily work of the royal gun factories, it will prove a valuable auxiliary.

STEAM CARRIAGE FOR COMMON ROADS. — At Chemnitz, in Saxony, they have been trying a steam carriage for conveyance of goods through the streets without rails; it has carried 183,395 kilos. of goods in 44 runs, which have been easily made in all quarters of the town, on rises and on descents, and on various curves, without causing any accidents. Nearly all the weight is carried on the hind wheels. The engine makes little noise, and does not give out too much smoke.

THEOBROMINE FROM CACAO SHELLS. — The cheapest method of making theobromine is said to be from the cacao shells. They are boiled in water. The decoction is filtered, and the shells are pressed. Acetate of lead is added to precipitate tannin and coloring matter, and the excess of lead is removed from the filtrate with sulphuric acid. The filtrate is concentrated, burned magnesia is added, and then it is evaporated to dryness, when the theobromine can be extracted from the residue with eighty per cent. alcohol. It is purified by re-crystallization from water. The yield of four or five kilograms of shells was 18.5 grams of the colorless preparation.

SOMETHING NEW IN ROAD-MAKING. — A London medical exchange says that a novel system of road-making was recently exposed at the Hammersmith Police Court, where a contractor was summoned under the Public Health Act in respect of a nuisance in Chiswick caused by an accumulation of offensive matter. It was shown that the defendant was the contractor for making up certain roads on the Glebe Estate, and used large quantities of "hard core," consisting of the sifting of ashes and broken crockery-ware. The evidence proved that a great portion was not "hard core" of this description, but tins of putrid meat and fish, which became broken by the traffic over them, emitting a most offensive smell.

A NEW USE FOR MICA. — Mica has been applied to a new use, that of fashioning it into middle soles to boots and shoes. A sheet of mica is imbedded in thin coatings of cement, and placed in the boot or shoe under and adjacent to the insole, the upper leather of the shoe lapping over its edges, or next under the filling, or between the filling and the outer or bottom sole, and covering the upper space from the toe to the instep.

SHOOTING WHALES. — The "modern improvements" in the whale fishery are as remarkable as in other industries, though not so generally known. One of the most noteworthy of these is the javelin-bomb, an account of which Mr. Voy, of San Francisco, has lately sent to *La Nature*. It consists of a metallic cylinder terminated by a cylindrical bomb, at the end of which is a rod with a very sharp, barbed point. This projectile is sent off by means of a kind of arquebus rested on a thin vertical support, and on the shoulder of the man who fires. At the moment of firing, a small screen rises automatically (to protect the man's person), and the projectile goes off. The latter is attached behind to a cord which it draws out with it. If the shot be a good one, the projectile enters the body of the whale, and the shell then explodes, causing a piece of iron to open out, so as to form a kind of double hook, by which the whale is held. The projectile is generally fired from a rowing boat. The instrument is a powerful one. In some instances the projectile could be driven 80 meters; in which case it and the cord drawn out would weigh not less than 100 kilograms. Mr. Voy describes a striking incident in which a large, yellow-bellied whale (a kind very rarely attacked on account of its tremendous vigor) was shot at from a small five-ton steamer when quite near. The projectile went right through part of the body and exploded beyond. The whale was attached, however, by the cord, and it dragged the steamer four consecutive hours, at a speed sometimes of 16 kilometers an hour, though the engine was reversed. Sunset came, and the whale being still lively, the cord was cut.

PRACTICAL RECIPES.

DYEING IVORY. — Ivory may be dyed or stained by any of the ordinary methods employed for woollen, after being freed from dirt or grease, but more quickly as follows: —

(1.) *Black.* — The ivory, well washed in an alkaline lye, is steeped in a weak neutral solution of nitrate of silver, and then exposed to the light, or dried, and dipped into a weak solution of sulphide of ammonium.

(2.) *Blue.* — Steep it in a weak solution of sulphate of indigo which has been nearly neutralized with potassium carbonate, or in a solution of soluble Prussian blue. A still better plan is to steep it in a dyer's green indigo vat.

(3.) *Brown.* — As for black, but using a weaker solution of nitrate of silver.

(4.) *Green.* — Dissolve verdigris in dilute acetic acid in a glass or stoneware vessel, and steep the pieces therein for a short time. Or use a solution of verdigris 2 parts and sal ammoniac 1 part, in soft water.

(5.) *Purple.* — Steep it in a weak solution of gold terchloride, and expose to sunlight.

(6.) *Red.* — Make an infusion of cochineal in solution of ammonia; in this immerse the pieces, previously macerated for a few minutes in water very slightly acidulated with nitric acid.

(7.) *Yellow.* — Steep the ivory for some hours in a solution of sugar of lead, then dry it and immerse it in solution of potassium chromate; or macerate it for some hours in a saturated solution of orpiment in ammonia, and dry it in a warm place.

CEMENT FOR RUBBER. — Powdered shellac is softened in ten times its weight of strong water of ammonia, whereby a transparent mass is obtained, which becomes fluid after keeping some little time without the use of hot water. In three or four weeks the mixture is perfectly liquid, and, when applied, it will be found to soften the rubber. As soon as the ammonia evaporates, the rubber hardens again, — it is said quite firmly, — and thus becomes impervious both to gases and to liquids. For cementing sheet rubber, or rubber material in any shape, to metal, glass, and other smooth surfaces the cement is highly recommended.

Agriculture.

FOOD VALUE OF APPLES.

WE continue our observations on the food value of apples from the last number of the JOURNAL. Our analysis of apples as there presented shows that the amount of nutriment or absolute food they contain in proportion to bulk is small. In order to bring the facts home to the understanding of farmers, let us contrast them with potatoes and some other vegetable foods. The following is an analysis of the *Early Rose Potato*, a variety extensively raised in New England: —

Water	78.01
Albumen, caseine, vegetable fibrine	3.19
Gum, pectine, and organic acids	3.06
Fat	.05
Starch	13.40
Cellulose and ash	2 29
	100.00

The amount of albumen contained was found to be 0.90 per cent., or double the amount in apples; of caseine there is a trace, less than 0.02 per cent. The amount of water is less, and of starch, of which there is none in apples, we find more than 13 per cent. Assuming a bushel of potatoes to weigh 50 lbs., we have rather more than half a pound of albumen, a few grains of fat and caseine, and about 7 lbs. of starch. These principles comprise about all that has food value in potatoes. Contrasting the two sources of food, apples and potatoes, it will be seen that the latter have at least *ten times* the value of the former, unless an exaggerated estimate is placed upon the value of the glucose contained in apples.

Pumpkins and parsnips contain of albuminoids (the flesh-forming constituents of food) 1.06 per cent. more than potatoes, and of carbohydrates (fat-forming material) 8 per cent., — parsnips having much the most, — and therefore have a much higher food value than apples. Turnips occupy a low place in the scale of values in proportion to bulk.

A correspondent of the *New England Farmer*, having asserted that in feeding apples to his cows (the kind not mentioned) a bushel of ripe fruit gave "a pound of finely flavored butter," let us briefly examine the statement. In order to do this understandingly, we must consider the elements of food which afford money value outside of th

maintenance of the animal in health, and independent of any production of flesh. If we take a cow in milk, and feed her during 24 hours with a known quantity of food (maintaining her of the same weight at the close of the experiment as the commencement), we obtain valuable knowledge. We will give her of

Water	120 lbs.
Potatoes	30 lbs.
Grass	15 lbs.
	165 lbs.

	Composition of the Food.	Composition of the Milk.	Composition of the Dung.	Excretions of Lungs, Kidneys, and Skin.
	Lbs.	Lbs.	Lbs.	Lbs.
Water	143.92	14.78	48.83	80.34
Carbon	9.62	1.25	3.42	4.95
Hydrogen	1.18	.20	.42	.50
Oxygen	8.06	.64	3.01	4.41
Nitrogen	.38	.09	.18	.11
Ash	1.84	.11	.96	.77
	165.00	17.07	56.82	91.11

The above table shows at a glance how the food given has been utilized. In this case we have

Utilized as milk	17 lbs.
Indigestible matter	57 lbs.
The waste of the body	91 lbs.
Weight of food given	165 lbs.

The half bushel of potatoes and the grass give the solid constituents of the milk; the water supplies that fluid in the milk. The solid portion of the milk, the caseine, butter globules, sugar and ash, amount to 25 oz.; the butter about 12 oz., — the result of feeding 30 lbs. of potatoes and 15 lbs. of rich grass. If 30 lbs. of potatoes and 15 lbs. of grass give at the best but 12 oz. of butter, what can be obtained at the best from feeding one bushel, or 46 lbs. of apples alone? Compare the results of the analysis, and we reach approximative results of products. It is clear that a bushel of apples of the best ripe kinds fed to milch cows cannot return by any possibility more than 2 or 3 oz. of "finely flavored butter." The loose statements made by many farmers as the results of their experiments are not only worthless but misleading. Thousands of these errors are circulating through the press, and their influence is not good.

As regards apples as food for animals, our practical experience in feeding them confirms the results of analysis. They are of *some* value, and when fed in connection with meal serve to give zest to the appetite and keep animals in health. The riper the apples the better the results; and they should not be fed in a half-frozen state to milch cows, as this course will invariably cut short the milk supply. If they are cooked by boiling their value is much enhanced, as more perfect digestion results.

"SHEEP SHEARING."

The following capital story, which is copied from the *Springfield Republican*, illustrates in an *agricultural* way some transactions in the courts of Vermont which have rendered that State and its courts unpleasantly notorious throughout the country. The "squire" is evidently a St. Albans judge, who has recently promulgated an opinion in a railroad case which has excited the contempt and derision of every respectable lawyer and jurist in New England. St. Albans is not alone famous for its "*butter*;" it is better known for its railroad thieves and its weak judges than for anything else. When agriculture declines as it has in Vermont, and the young men leave for other States, the residuum of population left behind becomes poor and easily corrupted by designing politicians and tricky lawyers. Vermont is on the down-hill grade, agriculturally, morally, financially, judicially, legislatively. The ancient State has lost its good name, and its prolific crop of corrupt ex-governors and weak jurists is worse for it than would be a crop of Canada thistles so extensive as to cover every one of its farms.

HOW THE VERMONT SQUIRE OUTWITTED THE BOSTON LAWYER.

There was a certain Vermont farmer named Brown, who owned a large sheep-farm, and who, once on a time, finding himself in difficulties, came down to Boston and consulted his brother-in-law, who was a lawyer, as to ways and means of raising money. The lawyer, who was a keen man of business and had money to spare, agreed to lend the farmer such sums as he required, provided the latter would give him a first mortgage on the sheep-farm. The farmer assented to this, the mortgage was duly made and recorded, and the farmer returned home to Vermont with money in his pocket.

Time went on, and the farmer paid interest promptly, the same passing through the hands of one John Smith, who was a man of mark in the farmer's neighborhood and had accordingly been deputed by the Boston lawyer to receive the interest and forward the same to him.

At length, however, Farmer Brown finding little market for his wool, and having invested in certain worthless outlying farms, again fell into difficulties, and this time sought the advice and assistance of his neighbor Smith, who, after looking over the matter, agreed to advance Brown certain sums and take security by mortgage of the farmers' carts, wagons, horses, sheep-shears, and other personal property, the farm itself being already mortgaged to the Boston lawyer.

But Brown still failed to prosper, and at length could pay interest neither to the lawyer nor to Smith. Then it was agreed that his assets should be fairly divided between the two mortgagees, and Squire Joyce, a justice of the peace in the neighborhood, who was a member of the same church as Smith, was selected to act as referee. The parties met at the squire's office, and each spoke for himself, the lawyer first. Said he: "I have a first mortgage on the farm, duly executed and recorded, and of course the farm must belong to me."

"Not much!" said Smith, "I have a mortgage later than yours on the personal property, and if that is n't enough to cover my debt I shall grab the farm too. My equity is superior to yours. Is n't that so, squire?"

The squire hemmed and hawed and finally said to the lawyer: "You consented to Smith's mortgage, didn't you?"

"Never!" said the lawyer.

"That makes no difference," interrupted Smith, "I did it for you!"

"Jes' so, jes' so!" said the squire, "I remember. The whole business was mighty simple. You jest consented, as this Boston man's attorney, to Brown's making a mortgage to you."

"But what of it?" cried the lawyer. "He could n't give any binding assent to make his mortgage better than mine."

"Perhaps not in law," said the squire, "but in equity, — in equity, my dear sir; we go by equity here in Vermont."

"Yes, I call it *inequity*," said the lawyer, *sotto voce*.

"Besides," said the squire, "I am inclined to believe that it was the intention as between Smith and Brown that the mortgage of the carts and fixings should include the farm too, — though the writings don't jest say so. Was n't that so, Smith?"

"Certain!" said Smith.

"But that makes no difference," cried the lawyer, "you must go by the record; I've authority to that point," and he produced a bag full of books.

"Young man!" cried Justice Joyce severely, "I'd have you know that this court is n't hidebound by precedents. I sit here to do equity as I understand it. *Æquitas non sequitur legem. Ahem!*"

"That 's so in Vermont, by jingo!" cried the lawyer, waxing wroth.

"Order in the court!" cried the squire. "Besides, I mean to make it a rule in my court that the last mortgage shall always have priority. It 's so with wills, why not with mortgages? Answer that, you Boston chap!"

The lawyer was dumfounded.

"I find on the whole case," said Squire Joyce, summing up, "that the farm and personalty must be sold and Smith's debt and interest paid, no matter what becomes of this Boston man. And Smith, as you say you have an interest in the wheelwrights' and blacksmiths' shops up to the village and Brown owes a running account at both places, you just bring in those bills and mebbe — I don't say certain, but mebbe — we can fix those up if there 's any balance."

The lawyer took his books back to Boston a wiser man. Smith grabbed the farm and sheared the sheep, and said tauntingly to the lawyer, "What are you going to do about it?"

HINTS FOR FARM USE.

How to Use Hen Manure. — *The American Agriculturist* says: Dry muck, loam, or other earth will retard or prevent the fermentation and hold the ammonia that is formed. Water enough to keep quite wet will do the same in cool weather. Plaster with enough moisture will also absorb the ammonia, but dry plaster will not. The custom of mixing lime and ashes with hen dung is wrong. They drive out the ammonia instead of holding it. Mouldiness implies, and smell of ammonia proves, decomposition and loss of ammonia. But the smell of ammonia is extremely pungent, and unless it is very strong, not much loss need be feared. Since the chief fertilizing ingredient of hen dung is nitrogen, and it has so little phosphoric acid and potash, it is rather a stimulating than a lasting manure. Many farmers use it for corn. But nearly all of our experiments imply that this is poor policy, since corn gets but little help from nitrogen, and responds best to phosphoric acid and potash. A little in the hill, however, well mixed with earth, may be very useful to give the crop a start. Hen dung is useful for potatoes, garden vegetables, or indeed almost all crops, including strawberries and other small fruits.

English Crops. — Professor Roberts of Cornell University thinks that the secret of English success in raising big crops is mainly due to thorough manipulation of the soil. He says: —

It would take away the breath of a prairie farmer to hear an Englishman's enumeration of the "spuddings," the "grubbings," the "twitchings," the harrowings, the cross-harrowings, the rollings and crushings that a heavy clay field is subjected to before it is considered ready for wheat.

What is all this for? Simply to unlock the full storehouse of nature. That it is full has been

proven time and again. By actual analysis it is found that an average soil contains in the first six inches plant food enough for from fifty to one hundred and fifty full crops of grain. I do not desire to discourage the purchase and use of fertilizers, but what I do protest against is purchasing on time commercial manures at forty dollars per ton, which are really worth only twenty-five, to enrich cloddy fields already fairly rich in plant food, locked up, it is true, but there, none the less, only waiting a little judicious application of brain and muscle to set it free.

If these hastily jotted facts and impressions are the means of inducing my fellow farmers to reduce some of the useless trees and fences, or to give the fields an additional cross-harrowing or two before casting in the seed and asking the Lord to bless the labor of their hands, my object will have been attained.

SUNFLOWER SEED FOR POULTRY. — Sunflower seed is highly recommended by fanciers as food for poultry, especially as it tends to give a brilliant and glossy appearance to the plumage of exhibition birds. It is also excellent for stimulating the production of eggs, and moreover fowls are very fond of it. For covering or screening unsightly spots about the farm buildings the sunflower is very useful, and it needs absolutely no care nor attention. A new Russian variety has lately been introduced into this country which is remarkable for the size of its flowers, specimens of which have been exhibited in Philadelphia, measuring eighteen to twenty inches in diameter.

PAINT FOR FENCES. — A correspondent says: If the appearance is not an objection, crude petroleum makes an excellent preservative covering or paint for a fence. It darkens the color of the wood and brings out the grain, giving it much the appearance of pitch pine. Common pine tar makes a good covering, and should be put on hot, but it remains sticky for some time. If appearance is to be chiefly considered, there is nothing better than linseed oil and mineral paint, which is a rich dark brown, and contrasts well with green of foliage or grass. It is cheap and durable, — much more so than lead paints.

UTILIZATION OF THE FIBRE OF THE OKRA PLANT. — A medical subscriber of the JOURNAL in Alabama writes: "I have been for some years impressed with the feasibility of utilizing the fibre of the okra stalk. It yields a fine, beautiful thread equal to flax or jute, and is easily grown. The plant affords delicious and healthy aliment, and its seeds, when properly prepared, are equal in flavor to Java coffee, as we fully tested during the war.

GLEANINGS.

THE IRISH WAY OF WORKING. — There is food for thought in the following paragraph from the letter of a London correspondent: "Another peculiarity of Irish life very remarkable to a stranger is that everybody seems to do work by deputy. A proprietor of a landed estate, not worth a thousand pounds a year when interest is paid on the various mortgages, would never think of being his own agent, — that is, doing his own work on his own estate. Not at all. He employs an agent who, thinking him rather small fry, neglects him or hands him over to the bailiff, who again transfers him to his "head men," so that three people are paid for looking on before anybody does anything. This practice also may be in part the cause of the decay of the wild West."

ONE CAUSE OF FOREIGN SUCCESS IN ENGLISH MARKETS. — A correspondent of the London *Agricultural Gazette* reads the following little lesson to his clumsy countrymen: "It fell to my lot to-day to go to the shop of a leading provision merchant in a provincial town, and I noticed that American apples were being retailed therein at 2d. per lb.; Spanish onions at the same rate; Brittany butter at 2s. per lb.; whilst the eggs and ham and bacon were indisputably not of English origin. Now the disastrous season of 1879 — which caused all the English fruit trees to be barren this year — is no doubt to some extent responsible for this; but a certain woodenness about English country folk has a good deal more to do with it. Who ever saw a sample of English apples and pears or onions sent to market sorted to an uniform size and color throughout, as these American and Spanish growths invariably are? Where is English butter dished out in pretty little baskets, and its color heightened by pretty contrasting lines, as is the so-called Brittany? Even the foreign eggs were sorted to a size and a tint, and everything was done to heighten the effect of the goods on sale. Are English folk never going to learn that every housewife with ready money to lay out expects to have her fancy tickled by niceties of display, and that it is necessary, with all the world for competitors, not merely to learn how to produce a good thing, but also how to set it out to the best advantage? "

HOME COLONIZATION IN ENGLAND. — The *Pall Mall Gazette* announces an exceedingly interesting experiment in home colonization as now being tried in Cheshire. Mr. Binney, a Manchester solicitor, with a firm faith in the saving virtues of a peasant proprietary, was impelled a year ago, by a suggestion of Lord Derby, to put his theories to the test of practice. He bought an estate of 150 acres at Whitley, in Cheshire, and resold it in small lots of one, two, or more acres each to men who were willing to settle on the land. About half the estate has been resold, and twenty habitations have already been run up for the accommodation of the small land-owners. Each settler owns the fee-simple of his plot, and as the colony is within easy distance by rail from the great industrial centres of South Lancashire they can command a never-failing market for their produce. If this colony of market gardeners or peasant proprietors should prove a "trade success," a practical step of the first importance will have been taken to solve one of the most difficult problems of the day in England.

JAPANESE FARMING. — The following is from an article on agriculture in Japan in the *Transactions of the Asiatic Society:* "The Japanese farmer treats his soil as a vehicle in which to grow crops, and does not appear to regard it as a bank from which to draw continual supplies of crops; thus he manures every crop, and he applies the manure to the crop, and not to the land. He does not seek to increase the condition of the soil for future crops to any extent; only in the case of the paddy land is the manure applied before sowing the seed or putting in the plants, and then only a short time before, in the case of green manuring or the application of vegetable refuse."

A VERMONT FARMER'S EXPERIENCE WITH ENSILAGE. — A correspondent of the *New England Farmer*, writing from Norwich, Vt., says: "I opened my silo November 20th, and have been feeding from it since. It opened in good condition; the stock all eat it well and seem to thrive, — perhaps no better than they would on dry feed. I notice no change in quality or color of the butter. The cows have shrunk in milk about what I should have expected them to on dry feed, in their condition. It is heavy stuff to handle; one must have things arranged to handle easily and cheaply to do much with it. . . . The fodder, as taken out, is heavy, and entails considerable work in getting it to the stock. A cubic yard, taken from the top of the silo, weighed 1030 pounds, or over half a ton. Of course I shall find it still more solid, and consequently heavier, as I get nearer the bottom."

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JAS. R. NICHOLS, M. D., *Editor.*
WM. J. ROLFE, A. M., *Associate Editor.*

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LIGHTNING CONDUCTORS.

IT may not be regarded as seasonable, when the mercury is at zero and the ground covered with snow-banks, to call attention to lightning conductors, but the few short months will soon pass before the vivid lightnings and the reverberating thunder will awaken us to a sense of danger. Let us be ready to secure all the means for protection which science points out.

It is a little singular that the vexed question regarding the proper forms of rods has never been definitely fixed by science. We have never known whether rods should be constructed with reference to extended surface or large mass, as it has remained an unsettled question whether the electrical force moved upon the *surface* of metals or through the *mass*. Snow Harris believed in surface conduction, and so did the astute Henry. Henry considered that frictional electricity (the electricity of the clouds) passed at the surface, galvanic electricity through the mass. Faraday persistently opposed this view, and other eminent electricians have coincided in his theory. The question — one of great importance — has thus been left in doubt. "As respects electrical conduction," said Faraday, "no advantage is gained by expanding the rod horizontally into a strop or tube; *surface does nothing;* the solid section is the essential element." We have always believed that the electricity of the clouds, of high potentiality, obeys the law of Ohm; that its passage is dependent on the mass and sectional area of conductors or rods. No experiments ever observed led to the conclusion that static electricity exists only on the surface, and that when it is conducted away the surface plays the prime part. With the extended employment of electricity in telegraphs, electric lighting, etc., static discharges are constantly observed, and in all cases they unmistakably follow Ohm's law. The practical importance of the question is of no small magnitude, and we are pleased to find that Mr. Preece, in a brief paper read at the last meeting of the British Association, has, by experimental work on a grand scale, demonstrated that the views we have held are correct. Cloud electricity is conducted by *mass*, and hence it is important that rods should be, like those of Franklin, of large size, and not constructed of thin ribbons of metal. The best rods, in our view, are of solid iron, three fourths of an inch in diameter, and galvanized to prevent rust. Common gas pipes of that size afford excellent conductors, and when properly placed on buildings the protection is perfect. Some of the wire cable rods of large size are efficient, but the usual "peddler" rods hawked about the country are a fraud, and should be avoided.

ADULTERATIONS OF FOOD, ETC.

A MOVEMENT has been made to prevent, by the passage of stringent national laws, adulterations in foods, drugs, etc. This effort springs unquestionably from the most honorable and praiseworthy motives, but still it is a moveme

which demands very careful consideration. We have, as all our readers know, discussed the questions of food and other adulterations during the past fifteen years in a fearless but candid manner, and one of the conclusions reached has been that there is much that is sensational in the statements of parties calling themselves chemists, who allege gross adulterations to exist. That food and drug sophistications exist is true beyond all question, but that the evil is of the extent claimed by sensational writers and empirics in science is not true. A bill has been framed by an organization in New York, the "National Board of Trade," which is to be presented to Congress, and its passage advocated. We have looked over this bill, and while its provisions are apparently commendable and protective, it should be accepted with hesitancy. It is a common belief among well-meaning, educated people, who are not specially acquainted with science in its practical adaptations, that all chemists are honorable and just men, and competent to detect all forms of fraud and point out with unerring accuracy the slightest deviation from integrity in the mixing and compounding of all articles of food and medicines. No error is more palpable than this. This country, and, indeed, the civilized world, is filled with adventurers who call themselves "chemists;" men who have "graduated" at the schools, but whose qualifications are of a low order, and whose moral status is quite often unsatisfactory. The work of a public analyst is exceedingly difficult and delicate, and these men are not suited to the position; but they are the very ones who by clamor and political influence would secure the positions.

In England, under the adulteration act, a class of men of the above description hold most of the positions of public analysts in the kingdom, and the records of the court proceedings, arising from prosecutions under the act, are disgraceful in the extreme. There is a tendency to too much legislation, a kind of legislation that indirectly hinders honorable commerce and business transactions. At the present time, the evil of adulteration in this country is not of such magnitude as exists in England. The Parliamentary acts, by their enforcement, have not tended to diminish the evil or to protect the public, and we incline to the opinion that such would be the result here. Vexatious and unjust prosecutions constantly occur, and very absurd and erroneous evidence is given by the so-called chemists. The adulterations that exist in foods are by no means alarming, and we incline to the view that for the present Congress had better let the matter rest.

WHAT IS IT?

THERE is a chemical substance which almost all persons in the civilized world have seen, — persons above the age of ten years, — which is more powerful for good or for evil than any other agent known to chemists. A single drop of it has sent thousands to prison and to the executioner; it has caused the death by violence of more persons than gunpowder or the sword; it has sent misery and desolation into thousands of happy families; it has caused suicides, suffering, penury, and starvation; it has robbed children of their inheritance, and widows and mothers of their daily food, and sent them to a premature grave; it has filled nations and kingdoms with beggars, broken up family relations, and scattered households to all parts of the earth; it has caused religious persecutions, murders, and death in all possible forms.

This agent, so powerful for evil, is all powerful for good. It has emancipated millions from a state of slavery to freedom and happiness; it has saved thousands from the prison and the gallows; it has fed the hungry, clothed the naked, given rest to the weary and joy to the disconsolate; it has raised in a moment the poor to affluence, saved kingdoms from the ravages of war, restored order where riot and bloodshed prevailed. Without it all law and order would perish, all security for life or property would come to an end. This chemical substance is not as dangerous as gunpowder or nitro-glycerine to handle, and yet a single drop has caused more deaths than all the nitro-glycerine ever manufactured. What is it? Among the readers of the JOURNAL there is a multitude of sharp, thoughtful boys and girls, and we will give a year's subscription to the boy or girl who *first* sends to us a correct answer to the above inquiry. Answers can be sent on a postal-card to the office of publication.

METEOROLOGY FOR DECEMBER, 1880, AND REVIEW OF THE YEAR.

THE sum of my observations on the weather for the past month has been as follows: —

Average Thermometer.	Lowest.	Highest.	Range.
At 7 A. M. . . . . 19.42°	-4°	37°	41°
At 2 P. M. . . . . 29.74°	6°	42°	36°
At 9 P. M. . . . . 23.06°	-3°	33°	36°
Whole month . . . 24.08°	-4°	42°	46°
Last 17 Decembers . . 25.70°	17.15° in 1867	33.76° in 1877	16.61°

The average barometer for the month was 29.859 inches; the lowest 29.50, on the evening of the 29th, and the highest 30.27, on the 25th, giving a range of .77 of an inch. The sum of the daily variations was 5.88 inches, or an average daily movement of .190 of an inch. The largest daily movements were on the 1st, 5th, and 26th of the month, being .45, .43, and .42 of an inch respectively, in connection with the fall of snow or rain, as usual.

The face of the sky in 93 observations gave 46 fair, 13 cloudy, 23 overcast, 1 rainy, and 10 snowy; The amount of rain, including melted snow, was only 2.87 inches; while the average amount for the last twelve Decembers has been 3.35 inches. The least amount was only .75 of an inch in 1875, the greatest 5.57 in 1879, a range of 4.84 inches. The amount of snow during the month was 19 inches, 8 falling on the 1st, 7 on the 30th, and 4 a few days previously, which furnished fine sleighing the greater part of the month.

The average direction of the wind, in the usual observations, gave an excess of 21 northerly and 63 westerly over the southerly and easterly, indicating the approximate average for the month N. 70° 30′ W., or nearly W. N. W.

By the above it will be seen that the temperature of this December was about one and five eighths degrees below the average for the past 17 years. As in the last month, the greatest severity naturally came near its close; and in each case a peculiarly wide-spread cold wave extended over a large part of the country, giving a decided specimen of New England weather quite down South, including the last wave repeated, and in some instances heavy falls of snow, as in Washington, D. C., Richmond and Petersburg, Va., Augusta, Ga., and other Southern cities, where snow seldom falls. It may be said that the present winter came upon us early (about the 20th of November), suddenly, and with unusually continued severity till the present.

REVIEW OF THE YEAR 1880.

	Temperature.			Rainfall in inches.		
Months.	1880.	17 Yrs.	Diff'ce.	1880.	12 Yrs.	Diff'ce.
Jan.	32.96°	22.92°	+ 10.06°	4.10	3.72	+ .38
Feb.	30.68	24.86	+ 6.32	5.00	4.39	+ .61
March	32.78	31.39	+ 1.39	3.22	5.57	— 2.35
April	48.18	43.96	+ 4.22	3.65	4.52	— .87
May	64.28	56.14	+ 8.14	1.57	2.68	— 1.11
June	68.33	66.68	+ 1.65	2.13	2.95	— .82
July	71.77	70.67	+ 1.10	6.45	3.21	+ 3.24
Aug.	69.06	68.19	+ .87	3.57	4.33	— .76
Sept.	63.40	59.98	+ 3.42	1.70	2.32	— .62
Oct.	49.49	48.47	+ 1.02	3.14	4.40	— 1.26
Nov.	35.71	36.08	— .37	1.90	4.15	— 2.25
Dec.	24.08	25.70	— 1.62	2.87	3.35	— .48
Totals.	49.23	46.21	+ 3.02	39.30	45.59	— 6.29
1879.	47.72	46.02*	+ 1.70	45.82	46.16*	— .34

* One year less than the number above.

Barometer — 1880.				Barometer — 1880.			
Months.	Average.	Range.	Aver. varia.	Months.	Average.	Range.	Aver. varia.
Jan.	30.080	1.10	.257	Sept.	29.966	.57	.110
Feb.	29.970	1.31	.355	Oct.	30.051	.90	.161
March	29.973	1.04	.273	Nov.	30.198	.97	.246
April	29.879	.66	.225	Dec.	29.859	.77	.190
May	29.996	.45	.123				
June	29.926	.70	.108				
July	29.930	.39	.092	Total.	29.891	.785	.186
Aug.	30.010	.56	.088	1879.	29.951	.963	.196

By comparing the columns under temperature, we notice that the average for each month in 1880 is higher than the general average for the last seventeen years, except for November and December, which fell somewhat below. January was full ten degrees above, May more than eight, February more than six, and so of others, making the average of the entire year over three degrees warmer than the average of the past seventeen years. It was the warmest, with only two exceptions; and those were only about one fourth of a degree warmer.

In like manner, by comparing the columns under the rainfall, we notice quite an opposite result, — the smaller amount than the average in nine months of the year, while only January, February, and July exceed the average, the entire deficiency of the year being over six and a quarter inches, or nearly one seventh, less than usual. This accounts for the low state of the springs and water supply during the autumn months and the opening winter. And may not this scarcity of rain have some influence on the increased temperature of the year? The larger the amount of rain, the greater the evaporation and the cooler the atmosphere, other things being equal.

The barometer has ranged a trifle lower in 1880 than in 1879, the difference being only .060 of an inch. The entire range of the year 1880 was from 30.57 in January to 29.15 in February, equal to 1.42 inches; but in 1879, from 30.60 in February to 29.00 in March and April, equal to 1.60 inches. The average daily variations very nearly correspond, being .186 in 1880 and .195 in 1879. These movements also correspond in a degree with the smaller amount of rain in 1880, but cannot be regarded as to any great extent its efficient cause. The face of the sky and the direction of the winds may have greater influence, but these comparisons must be deferred to another report.

D. W.

NATICK, *January* 7, 1881.

AN ANCIENT COLUMBARIUM.

A WRITER in a Scotch journal, who has lately visited Rome, gives the following interesting description of an ancient *columbarium* on the Appian Way, which, as most of our readers doubt-

less know, is the great highway leading southward from the city, and is bordered for some miles with tombs of the classical period: —

A few yards further on the road, you enter another building and another period (that of Augustus and his immediate successors), when cremation was in full blast. This is a Columbarium, or antique pigeon-house, if the word be taken literally, where the ashes and calcined bones of the dead, placed in little earthen vases like so many apothecary's pots, are set in little niches like pigeon-holes, in nine rows all around the walls. Beneath each niche is a marble label set in the wall, and telling the name, age, and quality of the ashes when they died. The surviving friends of some individuals have expressed their affection in more elaborate fashion. A broken-nosed bust, all green with damp, representing a piquant and bright-faced young girl, labelled Julia, and wearing rows of curls on her forehead, is the tribute that a loving brother has placed over the calcined remains of his sister. As you lift the lids of these little pots, and take up the dust and tiny bits of bone of the very early dead, the old woman who is the guide, and who stands at the top of the long stair that leads down to this small but crowded cemetery, cries out, in an asthmatic voice, that it is forbidden to carry anything away, and glares down upon you as if you were a ghoul. If one could summon up the dead, what a strange gathering there would be here! There are over 200 labels with names upon them, but that falls short of the number of interments, for it was the custom to put the ashes of several friends into the same vase. The occupants of these pigeon-holes were the familiars and servants in the imperial household from Augustus to Nero. From one inscription you learn that the Commissariats of the first and tenth Legions rest in this tiny earthen vase; in another are the ashes of the gentleman who held the stirrup for the Emperor Claudius when he mounted his horse; here in one little pot is all that is left of the cashier of Augustus; in another the dust of that ancient Yorick, the court buffoon, who amused the saturnine Tiberius by mimicking the lawyers of the period. On a marble vase is a piteous appeal to modern Vandals, begging them not to touch the remains within, but to respect the manes; and around the pigeon-holes are paintings on the walls representing birds, and fruits, and flowers, and butterflies, and symbolical and mythological figures. In certain places you find amphorae or jars, from which libations were poured, and plates on which meats were offered to the manes of the deceased.

EDITORIAL NOTES.

Dangers of Athletic Training. — Absolute health is attained only by the symmetrical development of all parts of the body. The man with muscles of steel and a diseased heart cannot be said to be in good health, and disenses of stomach, heart, and nervous system are often — it may even be said usually — produced by that system of development known as training. At a recent rowing match in Philadelphia, two plucky lads in contesting boats fainted as soon as the race was over. Their condition, which was apparently good, was actually abnormal, and their systems gave way because the strain which their muscles met was too great for their vital functions. Recently a similar but more serious calamity occurred at Sag Harbor. A Brooklyn lad who had taken part in a pedestrian contest, when removed from the track, fell down dead. He had prepared himself for walking and running, and depleted his vital organs to build up his limbs. When the strain came, the impoverished and most important part gave way. The severe muscular exercise of college atheletes has carried off many fine young men by consumption, heart disease, and other disorders, directly traceable to the absurd overwork required of their bodies. There is a limit of human endurance. That limit is reached when the body is impaired in one quarter to benefit special organs. The severity of the test by which athlete prizes are won seems designed rather to award the laurels to him who is the least healthy, because more unevenly developed, than to the really best man.

What Blind Men Can Do. — The achievements of blind men in departments where their infirmity would seem to prevent their doing anything at all are sometimes very remarkable. A notable example is that of the Belgian physicist, M. Plateau. Mr. Herreshoff, an American engineer, well known in connection with the making of steam launches, torpedo boats, etc., is another. This man has been blind many years, apparently through some hereditary tendency, as his brothers and sisters are in the same state. His brain is a very busy one, and his energy unbounded. When but a lad he built a sailing boat, which was regarded as a marvel of beauty as well as of speed. He has learned, as he expresses it, to see with his hands, and can judge most accurately of the proportion of curves of a boat's bottom by passing his hands rapidly over it. He gives minute directions to carpenters and mechanics for the separate pieces, and with his fingers quickly detects any deviation from his instructions. Many years ago, Mr. Herreshoff formed a company for building small steam-vessels, and has been all along both president and actual superintendent of it. He is now reputed to be wealthy; but his energies show no signs of flagging.

"Important if True." — A German paper has the following startling announcement: A fluid whose illuminating power approaches that of the gases has been discovered by Herr Kordig, a Russian, and by him exhibited to the Polytechnic Society of Berlin. The material consists of a mixture of naphtha with some other substance, as yet kept secret, but the whole is perfumed with cinnamon oil. The chief advantage of this new illuminant is its entire harmlessness. Herr von Kordig sprinkled his clothing with some of the material, and, lighting it, he stood like a blazing pillar, without even his garments receiving any damage. One of the members of the Polytechnic Society also tried a similar experiment on himself, with equal success. It is stated that the cost of this new material is only 7½ cents per pound.

The St. Gothard Hospice. — As soon as the tunnel under the Mount St. Gothard is opened for traffic the celebrated house of refuge upon the summit of the mountain, the foundation of which dates from the fourteenth century, will be closed; for it is assumed that very few people will make the long journey on foot when they can travel from Göschenen at one end to Airolo on the other for a few cents. The hospice, destroyed by an avalanche about a hundred years ago, was rebuilt, only to be destroyed again by the soldiers of Massena's army in the course of the struggle with Souvaroff; but it was at once restored, and has been open ever since. The most frequent visitors have been workmen from Upper Italy, who travel in bands of a hundred or a hundred and fifty; and a great many German artisans have always been registered, while the Swiss and French workmen have never formed more than a small minority of the eighteen or twenty thousand who have, taking one year with another, been given a good supper and a night's lodging on their journey. The cost per head has averaged eighteen cents for each night; and the cost has been met partly by an annual subsidy from the canton of Ticino and the Italian government, and partly by voluntary subscriptions. When the railway is open, the solitude of the St. Gothard will be broken only by the occasional excursions of tourists and chamois hunters.

Ruskin on Cookery. — Mr. Ruskin takes no mean view of the dignity of the cook's function. "What," he asks, "does 'cookery' mean? It means the knowledge of Medea, and of Circe, and of Calypso, and of Helen, and of Rebekah, and of the Queen of Sheba. It means knowledge of all herbs, and fruits, and balms, and spices, and of all that is healing and sweet in fields and groves, and savory in meal; it means carefulness, and inventiveness, and watchfulness, and willingness, and readiness of appliances; it means the economy of your great-grandmothers, and the science of modern chemists; it means much testing and no wasting; it means English thoroughness and French art and Arabian hospitality; and it means, in fine, that you are to be perfectly and always 'ladies,' 'loaf givers;' and as you are to see, imperatively, that everybody has something pretty to put on, so you are to see, yet more imperatively, that everybody has something nice to eat."

A Gross Literary Piracy. — We learn from the *Medical News* that certain English publishers have reprinted Mr. Presley Blakiston's "American Health Primers," omitting entirely the names of both editor and authors, and announcing the series as "written and edited by distinguished members of the medical profession," thus giving the impression that the books are of European and not American origin. To carry still farther this deception, they call them "Ward & Locke's Long-Life Series," as though it were an independent and original publication. In order to prevent the detection of this fraud, everything that could show that they were American in origin has been cut out.

"Salicylic" or "Salicilic"? — A friend suggests that the word is derived, not from *salicine*, or the Latin *salix*, *salicis*, but from the name of the radical *salicyl* or *salicyle* (C_7H_5O), assumed to be the basis of the acid. This would of course justify the spelling *salicylic*.

LITERARY NOTES.

The Appletons have just published Wurtz's *Atomic Theory*, translated by E. Cleminshaw, M. A. It is a historical account of this foundation theory of modern chemistry from the time of Dalton and Richter down to our own day. The contributions to its development by Gay-Lussac, Avogadro, Ampère, Berzelius, Dulong and Petit, Mitscherlich, Gerhardt, Laurent, Mendelejeff, Kopp, Kékulé, and others, are duly acknowledged and explained. Lothar Meyer's chart, illustrating the relations between the atomic weights of the elements and their physical properties, is appended. The whole is brought within the compass of 344 duodecimo pages, forming vol. xxix. of the "International Scientific Series."

Drainage for Health, or "Easy Lessons in Sanitary Science," by Dr. Joseph Wilson, Medical Director in the U. S. Navy, is a thin octavo of 68 pages, published by Mr. Presley Blakiston. It is simple in style, well illustrated, and worthy of all praise as a popular statement of the subject.

Notes of Hospital Practice, by Samuel M. Miller, M. D., of Philadelphia, who is also the publisher (see the advertisement on last cover page), is a compact and handsome volume. It is essentially a manual of therapeutics. The treatment of over four hundred diseases by the eminent medical authorities of New York and Philadelphia is condensed and epitomized in its pages. The proof sheets have, in every instance, been revised by the professors whose treatment is set forth therein. The sale of 5000 copies in twelve months is a strong argument in its favor. It will prove an indispensable companion to the hard-worked practitioner or pharmacist whose time is too much occupied to allow of his reading all the current medical literature, but who must needs keep himself thoroughly informed of all the salient points of progress in therapeutics.

A second edition of Dr. Charles Denison's *Rocky Mountain Health Resorts* (paper covers, $1.00) has been published by Houghton, Mifflin & Co. It is a thorough analytical study of high altitudes in relation to the arrest of chronic pulmonary disease. All the high places of the earth which have become resorts for this purpose are considered, but our own Rocky Mountain region is especially discussed and commended. The information is so full and minute that it makes a practical guide-book for the invalid traveller, besides being of special value to the physician.

Medicine and Pharmacy.

DELICATE TESTS FOR ORGANIC POISONS.

THE sensitiveness of many of the tests used in detecting minute quantities of matter has long been considered a standing marvel of modern chemistry; but, wonderfully delicate as these chemical tests are, there is a limit to their employment. In some cases it is extremely difficult, if not impossible, to prove the presence of mere traces of poison by their aid, and physiological tests are resorted to as being more refined. The effect of many alkaloids on frogs, mice, and other warm-blooded animals is often perceptible when the quantity is too infinitesimal to produce any appreciable chemical reaction; and this has therefore been used as a preliminary test when such complex and impure mixtures as the contents of a stomach have demanded examination. The poisons which can be detected in this way are strychnine, atropine and its analogues hyoscyamine and daturine, veratrine, antiarine, curarine and muscarine, and digitoxine the deadliest of the glucosides of the foxglove.

Strychnine, in doses of .00005 gram, produces tetanus and death in frogs and mice. In man and other mammals .0001 gram of atropine (or .0000005 gram, according to Kuiter) will cause dilation of the pupil. Veratrine in quantities as small as .00005 gram produces prolongation of the muscular curves in frogs. Digitoxine causes systolic stoppage of the heart in doses of .0001 gram; and the same effect is produced by .00005 gram of antiarine. Only .000005 gram of curarine is required to cause paralysis of the ends of motor nerves in frogs; while .0001 gram of muscarine causes diastolic stoppage of the heart.

Not only do these reactions indicate the presence of a poison, but they are sufficiently characteristic to distinguish them from one another. Inorganic poisons with such intense effect on the body are quite unknown.

At first sight it seems hardly possible that we should ever be able to detect smaller particles of such poisons. But Professor Rossbach has hit on an extremely simple and beautiful refinement of the process, which he describes in an Austrian journal, and of which we find an abstract in the *London Medical Times and Gazette*. Infusoria can be easily obtained by keeping an infusion of bread and meat for a few days in a warm place. Every microscopist is familiar with the process. A tiny drop of infusorial water may be placed on a slide without a cover, and brought under the object-glass. If while watching it carefully we allow the minutest possible drop of the suspected poison solution to touch its edge, most characteristic effects will appear. Infusoria are not only infinitely smaller, but are far more delicate, than the higher animals. The phenomena of poisoning of infusoria by large doses are instantaneous destruction of their molecular tissues and solution to a formless mass. Proportionately moderate and small doses produce violent swelling of the whole organism, intense dilation and paralysis of the contractile sac, and finally total breaking up.

Professor Rossbach gives some examples of the extreme delicacy of this test. A solution of one part of strychnine in 15,000 produces intense enlargement and paralysis of the contractile sac and swelling of the body. If a drop of water containing infusoria, and weighing .001 gram, be used as a test, the quantity of poison needed to produce these effects is .00000006 gram. A similar effect is caused by a solution of veratrine, 1 in 8000, the weight of alkaloid which can be detected being .00000022 gram. Atropine influences infusoria only when one part is present in a thousand of water, but even then a millionth of a gram (or a fifteen-millionth of a grain) of the alkaloid can be detected. Acids and caustic alkalies act only in solutions of 1 in 400 or 600.

Finally, the author says that if the stomach of a person poisoned by strychnine contains a liter (or quart) of fluid and only .05 gram (three quarters of a grain) of the alkaloid, a single drop of the fluid will contain forty times as much strychnine as is needed for this reaction.

INFANT PSYCHOLOGY.

THE study of mental phenomena in infants and young children cannot fail to be of much scientific value. A recent writer remarks: "The psychological analysis of a single child is worth more than a whole menagerie; he who knows well the mind of a little boy or girl is already an expert in psychology." This is a field, however, which has been least of all investigated, though so close at hand that every parent can be something of a psychologist if he choose. Some indication of what careful observation can bring out is found in a recent article from the pen of Professor W. Preyer, of Jena, of which we find a summary in the *New York Medical Record*. We believe that the following extracts from it will be of interest to every reader of the JOURNAL, and not merely to those who belong to the medical profession: —

The study must begin, Preyer says, with the observation of the movements and sensations of the child; we must then note the development of the different senses, the formation of speech, and the effect of all these things in awakening the intelligence of the child.

The first manifestation of voluntary motion occurs when the infant begins to hold up its head. Attempts to do this were noticed in the fourteenth week, and after four months the head was kept well balanced. Next after the head, the upper part of the body was balanced; and the full power to sit up was acquired at the tenth month.

Ability to stand was, in the cases studied by Professor Peryer, gained suddenly at the end of the first year. The movement of grasping sometimes takes place at a bound. A pencil is grasped mechanically, when put in the hand, in the first quarter-year, but the action is wholly reflex. The first voluntary attempt to take hold of an object was observed in the seventeenth week. This first grasping was at once followed by many others of similar character. The child does not show self-consciousness, a knowledge of itself as an independent person, until after the fifth quarter-year.

The sensibility of the skin of a new-born child is very low. We may stick needles into its nose, lips, or hands, without its giving any sign of discomfort. The eyes of new-born children close when they are touched, more slowly than at a later period, and they do not close at all when wet in the bath. An increase of sensibility may be noticed in one or two days after birth. Professor Kussmaul has shown that all new-born children can distinguish strong tastes. Taste, indeed, seems to be the first sense, after that of sight, which affords clear perceptions to the baby. It is the first which gives occasion for the exercise of the faculties of memory and judgment. Infants distinguish odors very early, but to what extent has not been ascertained. Some animals born blind are guided to their food — the mother's milk — by this sense. Some odors, as tobacco-smoke, have been found unpleasant to young animals; others, as that of camphor, agreeable.

All infants are deaf at birth because the outer ear is as yet closed, and there is no air in the middle ear. A response to a strong sound is observed, at the earliest, in six hours, but often, not for a day or two. The awakening of the sense may be observed by the irregular muscular movements and blinking which a loud noise occasions. No other organ contributes so much as the ear to the intellectual development of the child. This is shown by the intellectual backwardness of those born deaf compared with those born blind. The sense of hearing becomes early developed, so that the child soon distinguishes the different tones of those about him.

Light is at first unpleasant, and the infant shuts his eyes when brought to it. Brightness and darkness can alone be distinguished. The motions of the eyes are wholly unregulated. There is no real symmetry of movement before the first six days. The first perceptions are those of light. The child turns his head to the window within the first week. It is three weeks, however, before the eyes will follow a light that is moved before it.

The stupid expression on the child's face does not leave it until the second quarter-year. The face then begins to grow more human and spirited as the power is gained of regarding objects with a steady, independent look. The faculty of accommodation is then developing. The power to distinguish colors follows that of intelligent attention. Children all prefer light and bright colors; but they can rarely distinguish them by name before the beginning of the third year. . . .

In studying the growth of the faculty of speech, Professor Preyer set down upon paper every expression and sound that could be represented in writing, uttered by a child during its first two years. At first only the vowels are heard. Even in the first five weeks, however, these sounds are so diversified as to express many different feelings of the child. Thus the periodically broken cry, with knit eyes, denotes hunger; the continuous whine, cold; the high, penetrating tone expresses pain. Professor Preyer heard the consonant *m* during the seventh week; in the seventh month the consonants *m*, *b*, *d*, *n*, *v*, and rarely *g*, *h*, and *k* were distinguished. Very imperfect imitations of sounds were heard in the sixth month, and at this time voices began to be distinguished by the child. Great progress is made in the imitation of sounds after the third half-year, and the powers of articulation become well developed by the fourth half-year. . . .

THERAPEUTICAL USE OF CARBOLIC ACID.

IN June and October, 1878, we published some communications from a friend in this city upon the therapeutical use of carbolic acid. Portions of them were copied into many of the medical journals, and were received with much favor. The following notes are from the same source:

In regard to the use of carbolic acid for bronchial or lung affections in my own case, which was one of chronic bronchitis and severe coughs at times, the inhalation of a five per cent. solution of carbolic acid cured the bronchitis, and I have not had a cough, sore throat, or cold in the head for the past three and a half years. But as the causes which produce catarrh, coughs, etc., are always acting, at least in our climate, I use the spray more or less every day. Quite a number of people in this city have used it as I have directed, all of whom tell the

same story. Ordinary coughs are cured at once, and catarrh is at once relieved.

My daughter, thirteen years old, took a cold, and the cough grew worse in spite of all remedies usually given in such cases. It became so bad that she did not sleep for five nights. She slept a little sitting up in the day time, but the intermissions between the fits of coughing in the night while lying down were not long enough for her to get to sleep. I determined to try the carbolic acid in the case. The first day she used it several times, was better, and slept considerably that night. The next day I directed her to use it till it stopped the coughing, if she had to breathe it all day. She used it as directed, and that night she slept all night, and every night after, and in a week was well. She has not had a cough since.

I am perfectly satisfied that carbolic acid used with a Shurtleff's atomizer will invariably prevent a cough, as well as cure one. A little girl, less than three months old, took her first cold a year ago. Five per cent. spray was given her, and the cold was arrested at once. She has not had a cold since. The spray is given whenever a cold is feared. I mention this because five per cent. acid was used on so young a child.

Last year three little children were for a few days put in an institution among other children, and while there contracted conjunctivitis. The mother took the disease and had bad eyes about three months. Some of the children's eyes were affected more than six months. Several other persons who came in contact with them caught it, and I among the number. One night I found ropy mucus in my eyes, and a somewhat disagreeable feeling. Next morning it was purulent matter, the blood vessels of the conjunctiva were injected, and the eyelids tumefied, with intense pain and itching. I immediately began to blow the spray into my eyes. In three hour's time the purulent discharge ceased. I applied the spray at frequent intervals until midnight. In the morning there was no inflammation, but the conjunctivæ felt dry and rough. I did not use the acid till eleven o'clock at night, when on feeling an itching sensation, I used it an hour. The next day there was no recurrence of the symptoms, and I used the acid no more. It was painful at first, but after a while the eyes became insensible to pain. My symptoms, so far as I allowed them to go, were precisely like those of the others.

After looking over what I wrote in October, 1878, I wish to say that I was mistaken in the opinion that the pure acid would make a bad sore if not washed off. I thought I had seen such an instance, but have never seen any injury result from its use since, and I frequently use it pure on small injuries, and do not wash it off, but put a plaster over it, after which they heal without suppuration or inflammation. In eczema palmaris, where the hands are so tender that salt, acids, etc., cannot be borne, nor even soap and water — when the itching and smarting are intense — pure carbolic acid applied freely immediately removes all the disagreeable sensations. I apply glycerine afterwards, but because it keeps the skin soft and removes the sensation of dryness. Salt will not make the hands smart after the acid is applied. If there should be cracks and fissures, court plaster should be applied, and they will heal in a day or two after the acid has been applied.

Lately I have not used the hypodermic syringe to apply the acid to boils when they are recent. I take a needle with linen thread saturated with pure acid, pass the nee lle through the centre of the boil, draw the thread through and leave it there. If done as soon as the boil is noticed, during the first or second day, the throbbing ceases at once. An hour or two afterward I pull the thread through farther, after wetting it with more acid, and finally draw it out the same day. From the time they are transfixed they cease to be boils. The acid sets up its peculiar inflammation which soon subsides, and the reparative process commences immediately. Boils in the cavity of the ear are very painful, but the saturated solution, if applied at once and kept continually applied, will dull the sensation, and almost invariably check the development of the boil.

The acid is a local anæsthetic and arrests inflammatory action. For chapped hands I am using carbolic acid one part, glycerine two parts. Generally one application is sufficient. This same has cured every case of ringworm to which I have applied it; but I see that prominent English physicians use it in equal parts for that purpose. For burns it is beneficial in any form, but I keep it prepared for that use of the strength of 1 part to 10 of olive oil. For scalds which are painful but not so severe as to blister at once, if applied promptly it will stop the smarting, and if kept applied will prevent blistering. I keep it in contact with cotton batting. After blistering it will soothe and prevent suppuration if kept constantly applied. I should suppose that if the burn were deep and the cutis destroyed, the treatment would not prevent suppuration, etc.; still I have treated many cases of severe burns with ten per cent. carbolic oil successfully. They healed quickly, and without contractions such as are seen after burns.

SULPHATE OF COPPER IN RHUS POISONING.

Dr. A. W. Wiseman, of Jerusalem, N. C., calls attention in the *Virginia Medical Monthly* to the value of sulphate of copper, or "blue vitriol," in treating the eruption produced by poison ivy and kindred plants. The following is the more important portion of his article on the subject: —

For the treatment of this eruption I have never used but one remedy, and I have had less trouble with it than with skin diseases generally; and it is about the only remedy that I use empirically. It is the sulphate of copper. It may fail in some acute cases, but then this eruption hardly ever comes under the eye of the physician until the patient has tried "salt water," "nightshade and cream," "sugar of lead," etc., and consequently the eruption has reached the "mattering stage," as it is called. I have no particular strength for the solution. I always tell the patients to commence with just enough to color the solution, and gradually increase the strength until it produces a slight stinging, and to apply it three or four times a day.

This treatment was not based on any direct medical teaching, but was suggested by the following occurrence, which took place in my immediate neighborhood when I was a child. A negro man was mowing grass in a meadow on a very hot day. In the meadow there stood a willow tree, and beneath its shade the poison oak had overspread the ground and mixed with the growing grass. The mowers cut all down together. This plant, when cut, emits a milky juice, which soon darkens and dries into an inspissated extract, and I suppose that this extract contains the poisonous properties of the plant. At all events, this negro pulled off his clothes in the evening and wallowed over the swathes of new mown hay and poison oak cut down together, under the shade of this tree, his skin being softened by sweat. He was poisoned all over the surface of his body. He became a repulsive object. A foul fluid issued from his skin. His disease resisted a routine of remedies tried by one of the most celebrated physicians in that section. This physician worked on the case for over twelve months, I believe, without any apparent benefit. The owner of the negro, at last despairing of his recovery, sold him for three hundred dollars, though he was a young, able-bodied slave. The owner's sister, who was a widow, bought the negro. She sent to a neighboring store and bought *five cents' worth of blue stone*, and it cured him.

When I was a child, about seven years old, I got poisoned badly by picking up peaches under some trees that grew on the north side of a fence, a favorite place for these plants to grow. My hands swelled until I could not close my fingers. My face was swollen until my eyes were nearly closed. No physician was called in; but my mother, who knew all the facts in the above story, sent for some "blue-stone" in the utmost confidence. She used it as above indicated and it cured the eruption.

MEDICAL MEMORANDA.

Glue as an Adhesive Plaster. — Dr. Hewson, in a communication to the Philadelphia Academy of Surgery, describes the great advantage which attends the employment of a mixture of glue and acetic acid as a substitute for resinous adhesive plaster. It is made by boiling glue until it is thoroughly melted with four parts by measure of officinal acetic acid. The mixture so made can be long kept in a wide-mouthed bottle, and used as wanted, care being taken to keep the mouth of the bottle clean by wiping it well with a cloth dipped in warm water, so as to prevent the adhesion of particles of dust. After it has been applied to the part or to saturate bandages, it dries in about three minutes. It may be applied on gauze, linen cloth, or, when no traction is required, tissue paper. A few drops of otto of roses may be added to correct the smell. It causes no irritation to the skin, but if it comes in contact with the surface or edges of a wound it excites a burning sensation. The thinness of the film of the plaster so formed is of importance, and it should be spread on the objects either with a thin strip of wood or a feather.

Treatment of Sprains. — Dr. R. Dacre Fox in the *British Medical Journal*, suggests the following treatment: It may be divided into two stages: the first lasting from a day to a week or longer, during which the treatment has to be directed to averting inflammation by rest, warm applications, anodyne lotions, etc.; the second commencing when the joint has become cold, swollen, and painful on movement, — in fact, when the injury has assumed a more or less chronic character. This consists of pressure applied (around the ankle, for instance) as follows: The normal hollows about the joint are developed as far as possible by kneading the swollen and œdematous tissues which have obliterated them; then five pads of tow, lint, or leather, about one inch by two to four, adapted in shape to the normal hollows, are applied. They may, in old chronic cases, be fastened in place by a long, extended, half-moon-shaped piece of plaster (emplastrum saponis spread on leather), long enough for the ends to overlap in front when the heel is placed in the centre, and a narrow, oblong piece above this, placed around the lower part of the leg, to cover the upper part of the pads. The handiest way to apply the pads is to use an elastic ring over them, which may be cut when the oblong piece of plaster is put on. Lastly, the whole ankle is to be firmly bandaged.

The Very Latest Treatment of Diphtheria. — The *Philadelphia Reporter* states that the alarming prevalence of diphtheria in Brooklyn has led to the adoption of a new means of cure among the poorer classes, namely, the offering up of prayers and the performance of ceremonies in honor of St. Blasius. This saint was a German, who lived in the third or fifth century, whose feast is celebrated on the 3d of February, and who, although not mentioned in the great ceremony of the mass, has prayers in his honor in the rubrics. These prayers, which are very ancient, refer to him as one power-

ful by his intercession to assist those afflicted with throat troubles. The ceremony of invoking the saint's succor is as follows: The priest who recites the prayers for the afflicted person holds two candles against his throat so as to form a cross, the lighted ends reaching up on either side of the chin, and while he is in this position reads the prayers which are believed by the faithful to effect a cure.

A NEW SIGN OF DEATH. — According to *La Revue Médicale*, M. Peyraud states that real death may be recognized in a practical manner by the application of the Vienna caustic paste (or other caustics) to the skin of the subject supposed to be dead. If no eschar is produced, or if this is yellow or transparent, the subject is dead; but if it is black or reddish-brown, the subject is still living.

SELECT FORMULÆ.

PURGATIVE FOR CONSUMPTIVES. — Dr. Ferraud recommends the following prescription in the constipation of phthisis: —

℞ Magnesiæ calcinat.	3 ss ad 3 i.
Mannæ	ʒi. ad ʒij. M.

To be taken in a cup of tea.

When this is mixed with honey it makes an agreeable electuary: —

℞ Mannæ	3i.
Magnesiæ calcinat.	3ss.
Mellis	3i. M.

This may be taken in tablespoonful doses in the morning.

FOR CHILBLAINS. — The following formula for Dr. Valentine Mott's Remedy is given in the "Proceedings of the Medical Society of the County of Kings:" —

℞ Beef's gall	4 ounces.
Ol terebinth	4 "
Spts vini rect., 90 per cent.	1½ "
Tinct. opii.	1 "

Another formula for the same affection is: —

℞ Beef brine	1 pint.
Potassæ nitratis	2 drachms.
Aquæ ammoniæ	3 ounces.

COLD CREAM. — The following recipes are given in *New Remedies:* —

(1.) Spermaceti	30 parts.
White wax	24 "
Oil of sweet almonds	168 "

are melted together at a gentle heat, the melted mass poured into a warmed porcelain or wedgewood mortar, stirred until it begins to solidify, and then intimately mixed with

Rosewater	70 parts.

After stirring until cold, there may be added, for every 10 oz. of the mixture,

Oil of rose	2 drops.
Oil of bitter almonds	¾ drop.

This cream is white. The following formula yields a cheaper, slightly yellow, but still very good product: —

(2.) White wax	166 parts.
Olive oil, finest	500 "
Rosewater	100 "
Oil of bergamot	15 "
Oil of bitter almonds	q. s.

To be prepared as the preceding.

TREATMENT OF OZÆNA. — Dr. Thornton recommends the following liquid to be applied to the nasal passages by means of the spray: —

℞ Sodii carbonatis	3i
Sodii boratis	3i
Liq sodæ chlorinat.	3½
Glycerini	fl ʒ.3½

Dr. Lennox-Browne directs, for the removal of the nasal incrustation of persons affected with ozæna, to syringe out the nostrils several times daily with a lukewarm emollient solution, or a weak solution of salicylate of sodium; afterwards he applies the following by means of a brush. The nasal passages should be kept constantly clear and open, and should not be stopped with a tampon: —

℞ Iodoformi	gr 5
Ætheris	min 12
Vaselini	ʒ 1
Ol. rosæ	gtt. 5

GLYCERINE CREAM. — This French preparation is made by the following formula: —

Spermaceti	60 parts.
White wax	30 "
Oil of sweet almonds	250 "
Rosewater	10 "
Glycerine	20 "

To be prepared like cold cream, and to be perfumed with oil of rose and oil of bitter almonds.

FACETIÆ.

VARIETIES OF TIPSINESS. — Dr. Shorthouse, in the *British Medical Journal*, says that, according to his observation, intoxication from wine or malt liquor is likely to cause its subject to fall on his side, whisky brings him down on his face, and cider or perry invariably lays him on his back. He supposes that the different drinks act on various organs of the cerebro-spinal system. A contemporary suggests that, according to this theory, a carefully adjusted mixture of beverages might be devised which should have the effect of exactly balancing the imbiber.

"AN OPINION AS IS AN OPINION." — There is a good deal of human nature in the following from *Punch:* Nurse (to professional friend making a call): "'Well, Nuss,' sez he, 'igh and 'orty like, he sez, 'wot do you think?' says he. 'Doctor, I sez, quite differenshial, I sez, 'I'm quite of your opinion,' I sez. 'And I'm the same way of thinking, Nuss,' sez he. And so we settles it." Professional Friend (much interested): "Lor'! And wot was his opinion, now?" Nurse: "Bless yer 'art, my dear creetur, in course he never had n't given none!"

TO GUARD AGAINST SUDDEN DEATH. — An exchange gives the following rules for "escaping sudden death," and our readers will do well to have a copy of them in their pockets for reference in case of railroad collisions and other perilous accidents:

(1.) Keep the head cool by taking the world easy.

(2.) Keep the lungs breathing deeply and fully about seventeen times a minute, by cultivating alacrity in all the bodily movements.

(3.) Keep the heart beating about sixty-eight times a minute (that is, let the pulse beat four times while the lungs breathe once) by eating temperately, sleeping fully and soundly, exercising moderately, and avoiding all temporary excitants, mental or liquid.

THE LONDON LANCET ON EDISON'S "POLYFORM." — The *Lancet* says that Edison's new medical "discovery" is "on a par with that of a sportsman who should propose to load a gun at the same time with a bullet, small shot, and a tallow candle, so that the charge may be equally available whether his mark be a stag, a sparrow, or a deal board." Our contemporary, however, speaks of the "discovery" as the "precious compound which Mr. Edison is alleged to have invented," and seems not to be aware that the description of the nostrum which it quotes is taken from the official specification of the patent.

HOT TEA FOR A COLD. — The *Philadelphia Register* is responsible for the following: A gentleman went home the other night with a severe cold, and said to his wife, "I have to-day been told to take hot teas, — pennyroyal tea, barley tea, baked-lemon tea, beef tea, curry tea, hop tea, celery tea, licorice tea, red-pepper tea, baked-onion tea, mint-tea, hay tea, baked-apple tea, and burnt sugar tea." "Well," said the sympathizing wife, "which do you think you will take?" "If you have no objections," said he, "I think I will take the hot gin sling."

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Familiar Science.

THE UNITY OF NATURE.

THE papers which the Duke of Argyll is contributing to the *Contemporary Review* under the title "The Unity of Nature" are the sequel to his work "The Reign of Law," published fifteen years ago. In that work he endeavored to show the supremacy of law in nature, and illustrated his argument, as some of our readers may remember, by a remarkably beautiful description of the mechanism of the flight of birds. In this he displays the same purity and animation of style, which rises at times to the highest eloquence, the same extensive knowledge, profundity of thought, and thorough grasp of his subject, in the attempt to "trace the connection between the reign of law and the ideas which are fundamental to all religions." The idea that nature is one whole, as expressed by the Greek "cosmos," by our "universe," is to be found in the earliest historic times and in the most ancient literatures and traditions, as those of the Hebrews, the Egyptians, and, we may now add, the Chinese.[1] It is an idea inseparably connected with that of one Creator, and, as held by the common mind, is a higher and fuller perception of the truth than is ordinarily obtained by the scientific student. The chemist, for instance, is tempted to regard the unity of nature as simply a unity of composition; the anatomist as a unity of construction; and the physiologist as a unity of function.

Among the signs of unity definitely revealed by the study of nature is the force of gravitation, in subordination to which every force on the earth or in the heavens must work or be worked. Another is light, which is conveyed to our eyes by the tremors of an ethereal atmosphere, which rush from particle to particle at the rate of 186,000 miles in a second of time. This well-nigh inconceivable velocity shows that the light-bearing medium must be conceived of, not as an air, nor as a fluid, but rather as a solid. So that the earth must be regarded as in actual rigid contact with the most distant worlds in space, a conception not far removed from "the ancient idea of a crystalline orb." This medium is also the vehicle of heat, of chemical action, and apparently of the forces of galvanism and electricity. "Considering how all the forms of matter, both in the organic and in the inorganic worlds, depend on one or other, or on all, of these, — considering how life itself depends upon them, and how it flickers or expires according as they are present in due proportion, — it is impossible not to feel that in this great group of powers, so closely bound up together, we are standing very close indeed to some pervading, if not universal, agency in the mechanism of nature." Their close connection, as acting in a single medium, supplies a solid physical basis and is a "veritable cause for part, at least, of the general impression of unity which the aspects of nature leave upon the mind." For part only, because there are other close analogies which cannot be traced to the same agency; as, for instance, the atmosphere conducts sound in the same manner as the ether carries light, but they are very different agents. The truth probably is that there is one common law which determines the forms of motion in all matter, and especially in highly elastic media. The fact that one great vehicle of power is able to work so many different effects, not only without confusion, but with such perfect harmonies of results, points conclusively to a unity in the method of its handling and in the arrangement of the materials on which it operates. This is clearly shown in the composition of solar light as revealed by the spectroscope. "When we consider that every color in the spectrum represents the motion of a separate wave or ripple, and that in addition to the visible series there are other series, one at each end of the luminous rays, which are non-luminous, and therefore invisible, all of which consist of waves equally distinct; when we consider farther that all these are carried simultaneously with the same speed across millions of miles, that they are separable, and yet are never separated, that they move accurately together, without jostling or confusion, in perfect combination, yet so that each shall be capable of producing its own separate effect, it altogether transcends our faculties of imagination to conceive how movements of such infinite complication can be united in one such perfect order." And the difficulty is increased by the fact that these are all movements in a single medium. What idea, then, can we form of that unity which binds together the most stupendous phenomena of the heavens with the minutest phenomena of the earth, — a unity which consists in the adjustment of the elements of the sun with those of the ether, the atmosphere, and the forms of matter upon the earth?

In our delight at discovering the unity of these great forces in nature, we should not lose sight of their scarcely less important differences. It is correct in one sense to speak of the identity of light and heat as being simply forms of motion, but in another sense it is incorrect. Radiant heat, or the undulatory vibrations of pure ether, is identical in kind with light. But what may be termed "caloric," that is, heat considered as the vibrations of the molecules of solid or ponderable matter, "differs from light in being motion in a different medium or in a different kind of matter; in being a different kind of motion; in being producible without, so far as known, the agency of light at all," that is, by percussion, friction, etc. The same fundamental distinction applies to those ethereal undulations which produce the effects called chemical. The forces which give rise to chemical affinity are wholly unknown, and it is possible that the chemical rays only serve to set free the molecules to be acted upon by the distinct and separate forces which are the real sources of chemical affinity. But the unity which these great discoveries reveal to us differs from that which we receive from the evidence of the senses, and we must be cautious lest we regard the former as the higher, the latter as the lower, idea of unity. The most hideous discords and the sweetest harmonies are alike caused by a series of sonorous waves. But to regard them as identical, from this cause, is to lose sight of the far grander conception of the mind which conceived, arranged, and expressed with matchless skill these harmonies. Surely, to know the work which a machine does is more important than to understand its construction or the laws by which its movements are regulated. So that if there are two machines which are identical in structure, movement, and material, and yet perform totally different kinds of work, then it is certain that this difference is the most real and important thing about them.

This tendency in scientific men to exaggerate the importance of some newly discovered likeness in respect to form, or motion, or chemical composition is shown in the way in which life has been defined as simply a physical property of the substance found in all living organisms, and known as protoplasm. Considering the fact that there is a dead as well as a living protoplasm, it is no definition to say that life is a property of that which lives. It is rather a force or energy which works up the inorganic materials into protoplasm, and then continues to exert itself through this protoplasm. It is not a purely mechanical force, like that which causes the motion of a watch, nor purely chemical, nor purely electrical, nor anything to be expressed more simply than by saying it is life. So, again, be-

[1] This is shown in Professor Legge's "Religions of China," very recently published.

cause certain creatures, widely separated in the scale of being, can be traced back to some embryonic stage, in which they are undistinguishable in aspect or material composition, they are regarded as the same thing, only "differentiated" or "variously conditioned." This mechanical definition is, however, no explanation of the force which makes out of the albumen of an egg — by the mere application of heat — blood, flesh, bones, feathers, the whole wrought into one perfect organic structure. In the visible processes of crystallization, it would be absurd to ascribe the rushing together of the particles, to take their appointed place in the resultant form, either to the old arrangement or to the new. It is owing to some force which controls both. Equally absurd is it to ascribe to their "molecular condition" the motions of the particles of protoplasm in the "nucleated cell," by which are being built up, now a sea-weed, now a cedar of Lebanon, now an insect, now a fish, now a reptile, now a bird, now a man, each "after its kind." This molecular condition is not the cause of these vast differences, but some forces or formative energies which they obey. Though we do not know what these forces are in their ultimate nature, yet we can discern the deep underlying unity of their operations. For out of the chemical elements of nature it is the function of vegetable life to lay the foundations of organic mechanism. Animal life takes these materials, and builds them up into the highest and most complicated structures, — a vast cycle of operations depending upon adjustments among all the forces both of solar and terrestrial physics. Therefore, as science reduces all organisms to one and the same set of elementary substances, or to one and the same set of initial structures, we may be sure that their vast differences depend upon something else than their composition or their structure. And though we cannot explain what that something is, yet we can perceive the unity of its effects as of an infinite system of adjustments. Of this unity of nature, a unity consisting in similar principles of action, man is a part, both in body and in mind.

THE CHEMISTRY OF A LUMP OF CLAY.

CLAY, from the chemist's point of view, is essentially a silicate of alumina, or a salt made up of the three elements, silicon, oxygen, and aluminium. According to the old idea of the composition of salts, it is a compound of silicic acid, which we have in a quite pure form in quartz or "rock crystal," and alumina, which is an oxide of the metal aluminium. It generally contains some uncombined silicic acid, with variable but small quantities of lime, potash, or soda, and of oxide of iron or other metals. It is these admixtures or impurities which give rise to the many varieties of clay.

Clay, as we find it in nature, has been mainly formed by the disintegration of granite and other of the oldest or unstratified rocks containing *felspar* (or *feldspar*, as some prefer to spell it), which is generally called "a double silicate of alumina and potash," though oxide of iron sometimes takes the place of the alumina, and magnesia of the potash. By the long-continued action of the air, particularly of the carbonic acid in the air, the rock is gradually crumbled and decomposed. The potash is removed in the form of a carbonate, and the silicate of alumina is separated or washed out by the action of water. This appears to be the general process, though its exact nature is not perfectly understood.

That clay is a very common substance the reader does not need to be told; but that every clay-bed is a treasure-house of metallic wealth is not so familiar a fact to those who are not students of chemistry. Aluminium, the metal thus locked up, was a chemical curiosity until about twenty-five years ago; and though it has since come to be used to a limited extent in the arts, many of our readers may never have seen a specimen of it. It is a beautiful metal, and would be a most useful one if we could only separate it readily and economically from its compounds; but the key that shall release it from its confinement is yet to be discovered. We can, to be sure, break open the strong doors that shut it from us, but it is a costly undertaking; so that the most abundant of all metals is as yet one of the most expensive, and on that account one of the least useful to us.

Aluminium is nearly as white as silver, and has the advantage over that metal of not being affected by sulphur compounds. It is especially remarkable for its low specific gravity, which is only two and a half times that of water, while silver is ten and a half, or more than four times heavier. It is much the lightest of all the metals that are not affected by the action of the atmosphere. This would make it extremely serviceable for many purposes for which the heavier metals are used, if it were only cheap enough. At present, it is employed only for the manufacture of scientific apparatus in which lightness is an important requisite, and for a limited range of ornamental articles. One of its alloys, however, is extensively used as an imitation of gold. This is the so-called "aluminium bronze," composed of one part of aluminium to nine parts of copper. It combines the strength of iron with the color and general appearance of gold, though it does not retain its lustre so well as that metal.

Aluminium must for the present be reckoned among the "coming metals." The practical applications it has received only serve to suggest how useful to man it may hereafter be made; and when we consider how rapidly the nickel industry has been developed within a few years, we cannot doubt that aluminium also has a brilliant future before it. Science will find some easy means of setting it free from its compounds, as it has done with so many other valuable metals.

It is curious that clay has been from time immemorial the familiar symbol of our corporeal integument, and yet this metal aluminium is not one of the elements that enter into the composition of the body. If man was made of the dust of the earth, the dust was not taken from a clay-bank. Chemists have indeed sometimes found traces of aluminium in the body, but it is generally regarded as an accidental rather than a necessary ingredient. Hamlet says, —

> "Imperial Cæsar, dead and turned to clay,
> Might stop a hole to keep the wind away;"

but he could never turn to clay. To whatever "base uses" his dust might come, this plastic application would not be among the number. The "tenement of clay" which poets and rhetoricians make the dwelling of the soul, is built of no such material. "Alexander returneth unto dust; the dust is earth;" but it can never be the "earth" which chemists call alumina, nor any compound thereof.

Quite as curious as this metaphorical misnomer is the fact that clay, though not a constituent of the human body, and incapable of furnishing nutriment to that body, should nevertheless be an article of food with savage tribes in various and widely separated parts of the earth. These clay-eaters are found in Western Africa, in the island of Java, among the Himalayas, on the banks of the Orinoco, and in the mountain districts of Bolivia and Peru. In Northern Europe, too, especially in remote parts of Sweden and in Finland, a kind of earth, consisting chiefly of the shells of infusorial animalculæ, is much used for food. According to Humboldt, the earth devoured by the Otomacs of the Orinoco region is a true clay, unctuous and nearly tasteless. It is kneaded into balls, from four to six inches in diameter, and baked until the outside becomes reddish, — the color being due to a trace of oxide of iron. An Indian will eat about a pound of it daily, the quantity being greater when other kinds of food are scarce, though some is eaten even when fish is abundant. In Bolivia and Peru an unctuous clay is used, which is made into a kind of soup or gruel with the bitter potato of that region.

These edible clays have been analyzed by chemists, and some of them have been found to contain a little organic matter, but for the most part they are absolutely destitute of nutriment. The only purpose that they can serve is to eke out a scanty diet by mere bulk, allaying hunger by their presence in the stomach, "filling" though not nourishing. The appetite for them which leads to their use in connection with other food when the latter is plentiful must be the result of habit and association. Eaten in moderate quantities and with a fair amount of nutritious food, clay does not appear to be particularly injurious to health, but excessive indulgence in the argillaceous delicacy may prove fatal.

Of the industrial uses of clay it was not our purpose to say anything here, though we may refer to some of them at another time.

ABOUT ALLOYS AND METALLIC MIXTURES.

THAT certain alloys are chemical compounds, and not mere mixtures of their component metals, is clearly shown by the fact that they are formed by definite chemical proportions of these metals. It is evident, also, from the striking difference in properties which a slight change in the proportions will cause. A little more or less of one of the ingredients will give an alloy entirely different in certain important respects. The influence of minute traces of a metal (a very small fraction of one per cent., or too little to form what would ordinarily be called an *alloy*) in altering the properties of another metal also indicates that the action must be chemical rather than mechanical. The following illustrations of this influence are condensed from an interesting lecture by Mr. W. C. Roberts, before the Royal School of Mines in London: —

The presence of only $\frac{1}{300}$ of one per cent. of antimony in a mass of molten lead, the surface of which is exposed to the air, will cause it to be rapidly oxidized, while a similar mass of lead of equal surface,

but free from the minute quantity of antimony, will be but slowly acted upon; and it has been shown that $\frac{1}{1000}$ of one per cent. of copper is detrimental to the lead employed in the manufacture of white lead.

The presence of $\frac{1}{20}$ of one per cent. of lead or certain other metals in standard gold will render a bar an inch thick so brittle that it may readily be broken by a slight rap with a hammer. Less than $\frac{1}{2}$ of one per cent. of iron in metallic copper will reduce the electrical conductivity by about 60 per cent., while a far smaller quantity will render it quite unfit for manufacture into telegraph cables, or for other electrical purposes.

Dr. Fleitmann has recently shown that nickel, which breaks under the rolls, may be made perfectly malleable by the addition of a little over $\frac{1}{10}$ of one per cent. of magnesium. An ingot of a certain variety of steel containing no manganese will break into pieces at the first blow of the hammer, whereas a similar ingot containing $\frac{8}{100}$ of one per cent. of that metal will forge readily.

The influence of almost infinitesimal admixtures of non-metallic elements in metals is equally remarkable, as the following facts from the same source will show: —

Certain plates of Swedish puddled iron exhibited in the Paris Exhibition of 1878 were found to have a far higher resistance to fracture by impact than certain other plates compared with them; and yet analysis proved that the main difference between them lay in the fact that the good plates contained only $\frac{2}{100}$ of one per cent. of phosphorus, whereas the inferior plates contained $\frac{1}{10}$ of one per cent. more.

Carbon, it is well known, gives to iron fusibility, and renders it capable of being cast in moulds. The results of very many experiments appear to show that the presence of $\frac{15}{100}$ of one per cent. of carbon converts iron into steel, rendering it capable of being slightly hardened; with more than $1\frac{1}{2}$ per cent. of carbon the metal ceases to be malleable, and it is known as cast-iron.

The influence of carbon on the tensile strength of steel is very remarkable. Two samples under identically favorable conditions as to their amount of sulphur and phosphorus, but containing $\frac{15}{100}$ and $\frac{18}{100}$ of one per cent. of carbon respectively, will differ by six tons per square inch in breaking strain, or by an increase in the latter case of 27 per cent.

Nickel can be made malleable by the addition of $\frac{3}{10}$ of one per cent. of phosphorus. M. Nyst, of the Brussels Mint, has lately found that the presence of $\frac{15}{100}$ of one per cent. of silicon in standard gold will so affect its molecular grouping as to render it possible for a thin strip to bend by its own weight, as zinc would, in the flame of a candle.

HINTS FOR EXPERIMENTS.

The Crystallization of Tin. — Make a concentrated solution of protochloride of tin (by dissolving some of the metal in hydrochloric acid), and pour this into a test-glass. Into the solution put a strip of tin. Now carefully cover the surface of the solution with a thick layer of water. This may be effected without mixing the liquids, by introducing the water by means of a glass pipette, the water being allowed to run in a fine stream down the surface of the strip of metal. In a very short time, if the test-glass be left undisturbed, brilliant crystals of metallic tin will be found to have shot out from the strip of metal, and to have assumed a fern-like form. This crystallization takes place only in the layer of water.

Electric Paper. — It is a familiar fact that some ordinary kinds of paper, well heated and rubbed, show distinct electric phenomena. Herr Wiedemann has shown that Swedish filtering-paper, after a certain preparatory treatment, presents much more intense electric properties, giving sparks several centimetres long, etc. The paper is put into a mixture of nitric and sulphuric acids (equal volumes), as for making gun-cotton. Then it is washed well with water and dried. It should be placed on an insulating surface when rubbed.

Antimony as a Black Powder. — A solution of chloride of antimony (butter of antimony) is gradually diluted with successive small quantities of water, until, after shaking, the produced precipitate of basic chloride of antimony ceases to be redissolved. The clear liquid is then decanted, after standing a sufficient length of time, and small pieces of aluminium wire are added. This causes a violent disengagement of pure antimoniated hydrogen, and metallic antimony is deposited as a very fine black powder.

Phosphorescence of Cyanide of Potassium. — A correspondent in Kentucky writes: If a little cyanide of potassium be fused on a platinum wire, and allowed to run up and down it several times whilst in the melted state, and then permitted to cool, it will become phosphorescent on introducing it into the flame of a Bunsen burner. This can be seen in the light, but shows better in the dark. I have observed this for the last five years, but have found no one here cognizant of the fact, and have seen no mention made of it in any of the standard chemical works.

SCIENTIFIC BREVITIES.

The History of Aldehyde Green. — The origin of the brilliant green dye known as "aldehyde green" is rather curious. In 1861, M. Larette, a French chemist, obtained a very beautiful blue by the action of aldehyde upon a solution of some salt of rosaniline in sulphuric acid. The color, magnificent as it was, proved, however, to be utterly useless as a dye, as nothing appeared able to fix it on the tissues. After a while, another chemist, named Cherpin, made several efforts to fix the blue, but these turned out to be quite unavailing. At this juncture he mentioned the circumstance to a photographic friend, who of course knew no agent except hyposulphite of soda, which is used for "fixing" photographic proofs. The chemist Cherpin, who ought to have known better, followed the photographer's recommendation to try hyposulphite of soda, and the result was marvellous. What was his astonishment to find that, instead of "fixing" his blue, he turned it into a splendid green dye, to which the name of aldehyde green was afterwards given, and which has proved to be of great industrial value.

An Aluminium Battery. — A curious and novel voltaic cell has been devised by Herr Wohler, and described in *Liebig's Annalen*. The chief peculiarity is that both plates are of the same metal, — aluminium, — and a tolerably strong current is obtained. The cell consists of a glass vessel 6 inches high, filled with very dilute hydrochloric acid, or caustic soda, and containing an inner porous pot filled with concentrated nitric acid. In each compartment is placed a cylinder of aluminium provided with a projecting lug, which passes through the cover of the vessel, and acts as a contact piece for the electrodes or conducting wires. As soon as the aluminium cylinders are plunged into the acids, a current is given off sufficiently powerful to heat a platinum wire red-hot.

Popular Chemistry. — A recent German journal has an interesting paper on ortho-chlor-benz-para-toluide and its derivatives; namely, ortho-chlor-benz-meta-nitro-para-toluide, dinitro-ortho-chlor-benz-para-toluide, trinitro-ortho-chlor-benz-para-toluide, ortho-chlor-benz-amido-para-toluide, benzoylized ortho-chlor-benz-metamido-para-toluide, and anhydro-ortho-chlor-benz-metamido-para-toluide. Another article is an investigation of amidoazoxylol, para-xylendiamine, xyloquinone, and hydro-xyloquinone. A third describes homo-fluoresceine, its salts and derivatives. Though many of these compounds have splendid colors, only the nitro-derivatives are suitable for dyeing. Hexa-nitro-mono-oxy-homo-fluoresceine dyes silk a brilliant orange, the penta-nitro-diazo-amido-monoxy-homo-fluoresceine compounds a gold yellow, and cyamic acid a light reddish-yellow. Our readers will regret that the pressure of other matter forbids our translating these articles in full for our "familiar science" department.

The Camera as an Art Detective. — A new use for photography in connection with the higher arts has been found in the discovery that it may be relied on to detect restoration or tampering in any way with old paintings. On recently examining the first proof of a well-known Madonna, in the British National Gallery, it was observed that there was a disfiguring blur over the forehead. No such blur was discernible in the original,— at least at first glance. But the magnifying-glass showed, on careful inspection, that the restorer had been at work. He had repaired some casual damage with a skill that reproduced the color, the touch, and the texture of the painter, but he had not used the same pigments, and this was instantly detected by the subtle chemistry of light.

A New Oxide of Boron. — From recent experiments and analyses in France, it would appear that there exists a combination of boron with oxygen which has hitherto escaped the notice of chemists. The new boric acid is denoted by B_2O_4, and being the most oxygenated compound of boron known, has been named *perboric acid*.

CULINARY NOTES.

Cooking Turnips. — *The Caterer* says: Generally speaking this wholesome vegetable is presented in a washed-out state, so that it is quite seldom we discover its real flavor. Many will, perhaps, say that the real full flavor of the turnip is too strong, and this may be an argument in favor of the reduction of the flavor in the process of cooking. *De gustibus non est disputandum*, and those who cannot endure the full flavor of this root will have no trouble in subduing it. But it should be known that the saccharine and gummy constituents that are removed, and therefore lost, in the customary modes of cooking, are the most nutritive portion, and communicate to the dish when it is cooked, on what we may call "conservative" principles, a far finer flavor than the majority of people have any idea of. That we may be understood, we will ask the reader to cook two turnips in two different ways. The first is to be peeled and sliced, and left to soak in cold water for an hour or more. The slices are to be boiled until quite tender, and then are to be drained, and nicely mashed with butter. This is the most common method of cooking, and it has the demerit of washing the gum and the sugar, and the other finer constituents of the root, and consequently the flavor is very much reduced. The other root is to be washed quite clean; but it is not to be peeled, or cut, or soaked. Boil it whole, in its "jacket." It will take twice as long to cook as the one that was cut. When, by trying it with a fork, you find it quite tender, take it up, peel it, press it moderately, and mash it with butter. You will be surprised at the difference. Instead of being, as perhaps you will expect, "strong," "rank," or "bitter," it will be deliciously full-flavored, and will contain all the nourishment that was in it before it was cooked.

How to Cook Vegetables. — It is often observed that a meal from vegetables is not satisfying; but it frequently happens that the persons who thus

object do not know even how to boil a vegetable. The rule is simple, and should never be forgotten. Every kind of vegetable intended to be served whole should, when put to boil, be placed at once in boiling water; and this applies especially to potatoes and vegetables from which the outer cover has been removed. Now it often happens that potatoes, etc., are, to save time, placed in cold water and left to boil gradually. It is just this which allows the nutritious matter to escape, and renders the meal unsatisfying. When, on the contrary, the water boils from the moment that the vegetable is immersed in it, the albumen is partially coagulated near the surface, and serves to retain the virtue of the vegetable. The reverse is, of course, the rule for making soup, or any dish from which the water will not be drained. By placing the vegetables in cold water the albumen is slowly dissolved, and actually mixes with the water — a process most necessary for the production of nutritious soup.

A Good Recipe for Buns. — Take one cup of yeast, one cup of sugar, one cup of butter, three cups of sweet milk. Mix at night, omitting the butter and sugar; make a very soft sponge; let it stand till morning, and then add the butter and a pinch of soda and the sugar; let it rise again until it is very light, then knead lightly and put into the tins. When light enough bake in a moderate oven till the top is a dark brown. While hot rub over the top with a little bit of butter; this makes the crust tender and smooth. If you choose you can add English currants, and when brought to the table warm they are said to resemble the wonderful tea cakes of Mrs. Southey, which Shelley, having once tasted them, wished his wife to serve for supper forever after.

HOUSEHOLD HINTS.

Toughened Lamp Chimneys. — The following recipe is from a Leipzig journal devoted to the glass interest: Place your tumblers, chimneys, or vessels which you desire to keep from cracking in a pot filled with cold water, add a little cooking salt, allow the mixture to boil well over a fire, and then cool slowly. Glass treated in this way is said not to crack even if exposed to very sudden changes of temperature. Chimneys are said to become very durable by this process, which may also be extended to crockery, stoneware, porcelain, etc. The process is simply one of annealing, and the slower the process, especially the cooling portion of it, the more effective will be the work.

Cure for Dandruff. — Mr. John L. Davis, in the *Journal of Pharmacy*, asserts (having fully tested it in his own case) that a preparation of one ounce of sulphur and one quart of water, repeatedly agitated during intervals of a few hours, will, in a few weeks, remove every trace of dandruff from the scalp, and the hair will become soft and glossy. The head should be saturated every morning with the clear liquid. He says, "I do not pretend to explain the *modus operandi* of the treatment, for it is well known that sublimed sulphur is almost or wholly insoluble, and the liquid used was destitute of taste, color, or smell. The effect speaks for itself."

A Vegetable Diet for Children. — Dr. T. S. Clouston, lecturer on mental diseases in the University of Edinburgh, and a recognized authority in this branch, says in a recent article: —

My experience is that children who have the most neurotic temperaments and diatheses, and who show the greatest tendencies to instability of brain, are, as a rule, flesh eaters, having a craving for animal food too often and in too great quantities. I have found, also, a large proportion of the adolescent insane had been flesh eaters, consuming and having a craving for much animal food. I have seen a change of diet to milk, fish, and farinaceous food produce a marked improvement in regard to the nervous irritability of such children. And in such children I most thoroughly agree with Dr. Keith, who, in Edinburgh, for many years, has preached an anti-flesh crusade in the bringing up of all children up to eight or ten years of age.

Practical Chemistry and the Arts.

CORN AS FUEL.

In certain parts of the West where coal is not easily obtained except at great expense, the use of corn for fuel is beginning to be advocated. At first thought, this seems to be a wicked waste of a valuable article of food, but it is simply the cheapest means of supplying a human want no less imperative than hunger. It is quite as important that our bodies should be kept warm as that they should be supplied with food. Starvation, indeed, has been described as freezing to death, for it is the reduction of the animal heat which proves fatal. It is curious, by the way, that the word *starve* used to mean to be benumbed with cold; and Shakespeare employs it in this sense in several instances, as in 2 *Henry VI.*, iii. 1, 343: —

> "I fear me you but warm the starved snake,
> Who, cherish'd in your breasts, will sting your hearts;"

where the allusion to the old fable of the countryman who found the frozen snake and warmed it in his bosom is obvious.

But, to return to our subject, why should the raising of corn for fuel be regarded in any other light than forestry, or the cultivation of trees for the same purpose? In either case it is nothing but a method of getting back burnt carbon from the atmosphere, where it exists in the form of carbonic acid, in order that we may burn it again. There is plenty of the useful fuel in the air, but it has been consumed or oxidized, either in processes of combustion or respiration, or in the decay (which *is* combustion) of organic matter. We cannot separate it from the combined oxygen by any economical process at our command. All the skill of the chemist is here in vain; he cannot decompose carbonic acid by any method that will give it back to him as fuel for his fires. Thousands and thousands of tons of coal are floating viewless in the air, but it is as useless to us as the ashes from our coal-burning stoves and furnaces. But what man cannot do, every leaf that waves in the sunshine can accomplish; or, rather, every sunbeam can effect it in the laboratory of the leaf. Plants decompose the carbonic acid, set free the oxygen, and store up the useful carbon in their tissues; thus at once purifying the air by the removal of an irrespirable gas, the accumulation of which would soon render it unfit for the support of animal life, and preparing food and fuel for our use.

Now, if in certain localities this fuel can be obtained most readily and cheaply by raising corn, that is surely the way to obtain it; and of the ease and economy of the method in some parts of the West there can be no doubt. The *Iowa State Register* says on this subject: —

It appears to be generally conceded that corn can be raised as cheaply and will make as good fuel as any other substitute. We have tried it. Corn in the ear makes a good and durable fire, and can be burned in either hard or soft coal stoves, and is especially choice fuel for the cooking stove. An acre of corn can be raised for about $6, including the rent of the land. Fifty bushels of corn will weigh 3500 lbs., or equal to a ton and three quarters of soft coal. This, at 15 cents per bushel (which is as much as corn is worth on the farm away from railroads this winter), would be as cheap for fuel as soft coal at $4 per ton. Two bushels of corn will make a fire which will keep a family warm all day, even such weather as we have had since the commencement of holidays. . . . Some recommend raising sunflower for firewood, but it is not as good as corn. Nor need this talk about burning corn create any reluctance to removing to regions where they have to burn corn for fuel. It can be raised in one tenth of the time and at less expense than timber can be raised for the same purpose. And until we have more railroads, or roads of greater capacity, farmers on our wide prairies will have to burn corn. Be it understood, however, it will not take a very great emergency to induce them to do it.

CHROME INK.

Some of our correspondents appear to have a good deal of trouble with ink recipes, especially those for the so-called *chrome inks*; but there need be no difficulty in making such inks of excellent quality, if the directions are carefully and strictly followed. To test the matter, we have made some ink by the following recipe: twenty-four parts of solid commercial extract of logwood, one thousand parts of water, and two parts of yellow chromate of potash; or for a pint of water (a pound, or seven thousand grains), one hundred and sixty-eight grains of the logwood, and fourteen grains of the chromate. Dissolve the logwood in boiling water, filter it, and when cold add the chromate. A little carbonate of soda (a few grains) may be added to prevent the decomposition which, according to some authorities, is liable to take place in the fluid on exposure to the air. No gum is to be used, as it is not only unnecessary but injurious. The proportions must be exactly followed, especially in regard to the chromate, any excess of which is unfavorable to the perfection of the ink.

This fluid is of a deep blue-black color when first used, does not corrode steel pens, adheres so firmly to the paper that it may be washed with a sponge or left for hours under water without being dissolved out, and is not easily removed by ordinary chemical agents. It is also one of the cheapest inks that can be made.

Instead of the solid extract of logwood, a saturated solution of logwood may be used (made by boiling the wood in water), but the former, which may be bought of any dealer in drugs and dyestuffs at about twenty cents a pound, is much more convenient.

LUMINOUS PAINT.

We have already given some account of Balmain's luminous paint, patented not long ago in England. We do not know whether any experiments have been made with it in this country, but it is being tested in various ways in England, and thus far with very satisfactory results. It has been applied to ceilings as a water-wash, and the effect by night is that of "a subdued light, every object in the room being clearly visible." The luminosity, as our readers will remember, is excited by ordinary daylight, and its effects continue about thirteen hours, so that

it is well adapted for bedrooms, passages that are dark at night, and other places where the use of lamps would be objectionable or inconvenient. The London *Building News* says: —

For staircases and passages a mere band of the paint will serve as a guide, and costs but a trifle. For out-door purposes the oil paint is used, but for ceilings and walls the luminous paint mixed with water and special size can be used, the same as ordinary whitewash, and presents a similar appearance in the daylight. We have previously given a short account of the many applications of which this paint is capable, but the comparatively recent discovery that it can be applied as ordinary whitewash considerably expands the field of its usefulness. Sheets of glass coated with the paint form Aladdin's lamps, which are in use in some of the vessels of the navy, at the Waltham Powder Factory, at Young's Paraffin Works, and in the spirit-vaults of several docks; but now that, by increased production and the use of water as the medium, the cost is reduced by one half, it will probably be extensively used for painting walls and ceilings. The ordinary form of oil paint has already been applied in many ways to statues and busts, to toys, to clock-faces, to name-plates and numbers on house-doors, and to notice-boards, such as "mind the step," "to let," etc. The paint emits light without combustion, and therefore does not vitiate the atmosphere. Several experimental carriages are now running on different railways, the paint being used instead of lamps, which are necessary all day on account of the line passing through occasional tunnels.

MEMORANDA AND RECIPES.

Preserving Wood. — The improved French method of preserving wood by the application of lime is said to work well. The plan is to place the planks in a pile in the tank and to put over all a layer of quicklime, which is gradually slacked with water. Timber for mines requires about a week to be thoroughly impregnated, and other wood more or less time, according to its thickness. The material acquires remarkable consistence and hardness, it is stated, on being subjected to this simple process, and the assertion is made that it will never rot. Beech-wood prepared in this way for hammers and other tools for ironwork is found to acquire the hardness of oak, without parting with any of its well-known elasticity or toughness, and it also lasts longer.

To Bleach Straw. — Dissolve 108 grams (about 4 ounces) permanganate of potash (crystals) in 5 liters (or quarts) of hot water. Mix this solution in a tub of water until the water is a deep red. Enter straw which has previously been softened for several hours in a tepid bath of soda and well rinsed. Agitate the straw frequently. It will turn deep brown; if not, add some permanganate solution; leave it in till discoloration of the bath. When the straw is of a drab shade, rinse in cold water and enter in a bath of sulphurous acid. Make it of a sufficient degree to give forth odor. The discoloration of the straw takes place within 30 minutes, and generally turns a good white.

Quick Method for Vinegar. — A French method for converting cider into vinegar very rapidly begins by preparing the barrels or casks by first scalding them with water, and next pouring into them boiling vinegar, rolling the barrels, and allowing them to stand on their sides two or three days, until they become thoroughly saturated with the vinegar. This preparation over, the barrels are filled about one third full with strong, pure cider vinegar, and two gallons of cider. Every eighth day thereafter two gallons of cider are added until the barrel is two thirds full. In fourteen days after the last two gallons are added, the whole will have been converted into vinegar, one half of which is now drawn off and the process of filling with cider begun again. In summer the barrels during the process of conversion are exposed to the rays of the sun, and in cold weather are stored where a uniform temperature of about 80° can be maintained.

Seaweed and Fruit Jellies. — That the very cheap "fruit jellies" sold in this country are made of gelatine appropriately flavored, is an "open secret." It seems, from an article in the Paris *Temps*, that a similar falsification is practised there. Gelatine from fish was at first used, but was found too expensive. Recently, however, since the importation on such a large scale of Chinese and Japanese porcelain, etc., a new solution has been found to the problem. The objects imported are generally packed with a common maritime plant that is used instead of straw. This seaweed possesses, however, peculiar properties. When placed in a tumbler of water, it absorbs the water in a few minutes; then a number of shoots grow, and constitute a jelly nearly as transparent as the water from which it is made. This plant, the *Arachnoidiscus japonicus*, costs only the trouble of bringing it over. The jelly it yields is easily sweetened with glucose, and cochineal or other coloring matter is added with equal facility to imitate the color of the fruit. The perfume and the flavor are obtained by the use of various essences and ethers. The *Temps* explains how the fraud may be detected. The jelly still retains a little of the fibrous nature of the plant, and has a tendency to fall to pieces, instead of forming adhesive lumps. Examined by the microscope, it has no resemblance to the jelly made from fruit. Then it is easy enough to discover the presence of the artificial dye by dissolving a little of the suspected jelly in some tepid water, and dipping a white silk ribbon in the solution. If it is a natural jelly, the ribbon will only be a little soiled; but if the jelly has been artificially colored, the ribbon will also be colored.

Deterioration in Thermometers and Hydrometers. — M. Saleran, in *Comptes Rendus*, calls attention to defects liable to be produced in thermometers and hydrometers if used for certain purposes. Changes in thermometers ranging as high as 8o to 10o C. occur at printing-ink works, where oils are heated for several days to 670°, in glycerine works, and with rectifiers of benzol. Glass is not only modified when heated to 300°, but it undergoes true deformation at far lower temperatures. Thus, the hydrometers used in sugar works, which are often exposed for a considerable time to temperatures of 95°, are affected. After an immersion of some days they are completely modified, their weight decreases and they become erroneous to the extent of 7° to 8° B. The London *Chemical News* adds that in many chemical works it has been found necessary to submit all hydrometers used for hot liquids to a weekly comparison with a standard instrument.

HARNESS BLACKING.

A correspondent asks for a good formula for harness blacking. The following are commended by excellent authorities: —

(1.) Mutton suet	2 oz.
Pure beeswax	6 oz.
Melt together, and add —	
Sugar candy, in fine powder	6 oz.
Soft soap	2 oz.
Lamp-black	2½ oz.
Indigo, in fine powder	½ oz.
When thoroughly incorporated add —	
Oil of turpentine	5 oz.
and pour into pots or tins.	
(2.) Beeswax	1 lb.
Soft soap	6 oz.
Ivory-black	4 oz.
Prussian blue	1 oz.
Grind in —	
Linseed oil	2 oz.
Oil of turpentine	10 oz.

Mix as above.

Lay a very little on the leather, spread it evenly, and polish by gentle friction with a brush or soft leather. Both these are waterproof, and are suitable for harness or carriage leather.

(3.) The following has been used for harness, and also for leather bags, boots, etc., and is said to be admirable, if carefully prepared: —

Ext. logwood	2 oz.
Potass. bichrom.	2 drachms
Yellow pruss. potass.	2 drachms
Powdered borax	3 oz.
Liq. ammonia	2 oz.
Shellac	16 oz.
Water	1 gallon.

Dissolve the extract in the water, heating the liquid to nearly boiling, then add the chromate and the prussiate of potash. After a deep rich blue color has developed, add the borax, and when it has dissolved add the shellac, and lastly the ammonia; keep the whole at a gentle heat, stirring until the smell of ammonia has gone. The solution of logwood must be heated to nearly boiling-point before the salts of potash are added, or only a dirty blue color will be obtained.

Agriculture.

THE DEATH OF MR. MECHI.

The death of John Joseph Mechi, the well-known agriculturalist of England, owner of Tiptree Farm, occurred December 26th, in London. His illness was short, resulting from prostration consequent on the announcement of his bankruptcy. Mr. Mechi was a man of great energy of character, of an inquiring mind, but lacking in education and in practical methods of business. We remember him as he was twenty-five years ago, a genial, bustling, good-natured man; full of enthusiasm on all matters relating to improvements in farming, and speaking better sense in his conversation than he manifested in practical work on his farm. We visited Tiptree Farm when it was at its best, and stated at the time that we came away with a feeling of disappointment. A large amount of money had been expended, but the manifest incompleteness and neglect left unfavorable impressions on the mind of the American visitor. In consequence of his writings upon agriculture he became well known in England and in this country, and at the time we met him he was one of the aldermen of the city of London, and entertained expectations of becoming lord mayor. Financial troubles oppressed him for several years, and at the advanced age of seventy-nine he failed in business, and his death followed immediately.

The first of Mr. Mechi's agricultural publications was a letter printed in the *Agricultural Gazette* in 1844. It ended as follows: —

"I may be asked, 'What can you, as a Londoner, know about farming?' I will answer, I always loved the beauties of nature, the pure air of heaven, the sports of the field, and the hospitality of our honest yeomen. I have seen one farmer making a fortune and his next neighbor losing one. I have seen one field all corn and another nearly all weeds. I asked, 'How is this?' inquired into the causes, noted the results, obtained from all the best farmers and all the best agricultural books within my reach every information bearing on agricultural pursuits, practised in my own little garden, on a

small scale, a variety of experiments, and after carefully weighing the evidence, I came to the conclusion that want of drainage, waste of manure, shallow ploughing, and short leases are among the greatest curses to this country; and I, as far as my individual means will permit, am resolved on amending them."

This is good sense, and it exhibited a knowledge of existing evils in English husbandry in advance of the times. He was remarkable in his writings and speeches for a pure and lucid English style. His exuberant enthusiasm, sanguine and impulsive, was combined with an unextinguishable good temper, which enabled him to bear the rough criticism to which it sometimes laid him open. Much of the life and activity of thought in agricultural circles, at agricultural meetings, and in agricultural journals in England during the present generation has been owing to his irrepressible agricultural vitality.

THE CHEMISTRY OF ROOTS.

The chemistry of the chief roots, properly so called (the potato, for instance, is a tuber, not a root, in the strict sense of the term), which are used as food for ourselves and our domestic animals, is not only interesting, but practically suggestive. The turnip, the beet, and the carrot, as we know them, are in a sense the creation of man, having been developed from insignificant and comparatively worthless plants of wild growth, and they are striking illustrations of the power which he is able to exert over the vegetable kingdom by patient and intelligent cultivation.

One of the simplest items in the chemistry of a root crop is the amount of water it contains; it is a point, however, of great practical importance. It is not the gross weight of roots that benefits either the farmer or his cattle; it is the amount of solid matter which determines the value of the crop. This is always to be borne in mind in judging of the merits of the new varieties continually offered to the public. A "heavy cropper" may be so merely because its roots are more watery than those of other varieties. Agricultural and horticultural societies, in giving prizes for new roots, should make the percentage of solid matter in the root an important element in their decisions. The average amount of dry matter in our various root crops is as follows: turnips, 8 to 9 per cent.; carrots, 12 to 14; and well ripened sugar-beets, 16 to 18 per cent.

It is a necessity with the farmer to grow large roots, if he wishes to obtain a heavy crop; but it should be recollected that an excessively large root is always of inferior quality. In all vegetable growth, great luxuriance and rapidity of formation is associated with a more watery, saline, and nitrogenous composition. We cannot better illustrate this than by giving the composition (as determined by a German analysis) of some sugar-beets grown with artificial nitrogenous manure. Of these roots a sample of the small ones, about 1⅓ lb. each, was taken, and also a sample of the large roots, weighing 5¼ lb., with the following result: —

	Water.	Nitrogenous matter.	Sugar.	Fibre, etc.	Ash.
Small roots, 1⅓ lb.	84.4	1.2	8.1	5.2	1.1
Large roots, 5¼ lb.	88.0	2.1	5.6	1.9	2.4

It appears from this that 10 tons of the small roots would contain as much solid matter as 13 tons of the large roots. The comparison becomes still more striking, if we compare the character of the solid matter contained in these roots.

	Nitrogenous matter.	Sugar.	Fibre, etc.	Ash.
Small roots, 1⅓ lb.	7.5	52.0	33.4	7.1
Large roots, 5¼ lb.	17.6	46.5	15.9	20.0

It is a mistake to suppose that the large amount of nitrogenous matter in bulky, heavily manured roots must necessarily impart to them a high feeding value; albuminoids are, it is true, substances of high feeding value, but the chemist's figure for "albuminoids" or "nitrogenous matter" is obtained by calculation from the quantity of nitrogen present, and in immature vegetable structures the nitrogen exists in lower forms than albumen, which are without value as food for animals. We shall judge of the comparative feeding value of different roots far more correctly by looking at the amount of sugar and other carbohydrates present than by regarding the percentage of nitrogen. Comparing the large and small roots on this basis it will appear that 10 tons of the small roots are equivalent in feeding value to about 15 tons of the large roots.

A principal cause of the inferior quality of large roots is their want of maturity. A root becomes ripe when the plant has completed the first stage of its life; the growth of the root then ceases, Nature having accomplished all it had in view, and the plant remains at rest till the spring, when a new and final stage of existence is entered on by the production of a flowering stalk and seed. Ripening in a root crop is recognized by a general fading of the outer leaves. Now the season is often too short for ripening the large roots; they are probably still growing vigorously when winter sets in, and the crop is gathered before the first stage of growth has been fully accomplished. The degree of maturity materially affects the composition and the feeding value; a ripe root is far more nutritious than one that is immature. This is well illustrated by the following results of the analysis of sugar-beet, but at various stages of its growth: —

	July 19.	Aug. 17.	Sept. 1.	Sept. 21.	Oct. 4.	Oct. 12.
Water	86.1	85.2	84.4	84.8	83.9	83.5
Cellulose and pectine	8.1	7.4	6.7	5.6	5.7	5.9
Sugar	2.5	4.5	6.5	7.1	8.8	9.1
Albuminoids and undetermined matters	2.4	1 9	1.4	1·3	.7	.7
Ash	.9	1.0	1.1	1.3	.9	.8

The regular manner in which the percentage of sugar increases as the root matures, while all the other constituents relatively diminish, is plainly shown by these figures. The European growers of sugar-beet endeavor to obtain mature roots, as on this point the percentage of sugar chiefly depends. To this end they plant early and avoid stimulating manures, which will tend to produce large roots, that cannot in an average season attain to complete ripeness.

We give as a further illustration of the subject the results obtained by Bretschneider in his investigations of carrots in various stages of growth: —

	July 25.	Aug. 14	Sept. 19.	Oct. 10.
Water	90.6	90.2	90.5	89. 2
Albuminoids	1.1	1.0	.8	.7
Sugar	4.3	4.7	5.0	6.1
Fibre	1.1	1.3	1.2	1.2
Undetermined matter	2.3	2.1	2.0	2.1
Ash	.6	.7	.6	.7

The most prominent feature is again the formation of sugar, which steadily increases in amount as autumn advances; there is at the same time a diminution in the percentage of nitrogenous matter.

A SUBSTITUTE FOR THE SILO.

A Peekskill correspondent of the *N. Y. Evening Post*, referring to the use of the "silo" for the preservation of corn-fodder, remarks: —

Whatever the ultimate result of this method may be, it will certainly be some years before it comes into general use. In the mean time I suggest to you a plan that is so simple and feasible, and withal so efficient, that those who will can try it, and I am sure without detriment. I have used the plan for thirty years, and every time with good results.

Break up sod between the 20th and the last of June (after taking off the hay crop); sow corn in drills six inches wide and four feet apart, stretching a line and making the drill with a hand hoe, two to three inches deep; seed at the rate of three bushels to the acre; cover with manure, and cover the manure slightly with earth, using again the hand hoe.

When the corn is well up, run through with the horse cultivator; repeat this in all three times, the last time when the corn is two and a half feet high. Between the 1st and 10th of September cut the corn with a hand sickle. In the afternoon of each day tie the corn in bundles, and carry it off to adjoining grass land. The reason I remove the fodder to adjoining sod is that by the 12th or 15th of September I resow the land on which it grew with grass, so that I get my corn without the loss of a grass crop. Set poles, like bean poles, about ten feet apart, and around these stand up the buudles, about five or six hundred pounds around each pole; put a rope around, about half-way up; have one man pull on each end of the rope, while a third kicks in the bottom and ties where the rope is with a straw rope; use a step ladder, and tie the top also with straw.

Let it stand until wanted to feed out. I feed once a day from the first of December to the first of May. Remove to the stable enough for two days at a time; if the weather is cold, sufficient for four or five days may be taken to the stable at once. It does not require cutting; it will be green and tender, and the cattle will eat it without waste. I may add that I feed cut hay with corn meal and wheat bran once a day, and beets, carrots, or potatoes once a day. My cows are Jerseys, and my butter sells well, say, at about twice the price of "Western Creamery."

GLEANINGS.

Mulching Fruit Trees. — A correspondent of the *American Cultivator* gives a remarkable instance of the benefits of mulching. He says upon a dry and rocky hillside, in the town of Shrewsbury, Mass., stood an orchard. The trees were old, and had not given a good crop of apples for several years. The owner, having a large quantity of spoiled hay, drew it from the field, and placed it around the trees to

the depth of 12 inches, covering the whole ground occupied by the trees, omitting every alternate row. This was done in the month of July. The next year every tree where the mulch was applied was loaded with large and fair apples, while the trees had made a great growth of wood, and the leaves had a beautiful green and spring-like appearance, while those without the mulch bore no fruit at all.

About an Acre. — Our readers are aware that 30¼ square yards make a square rod, and that 4840 square yards, or 160 rods, make an acre. In measuring an acre by yards, the usual practice is to trace off 70 yards in length and 70 yards in width. This, in a rough way, may be considered near enough for practical purposes; but as 70 yards each way make 4900 square yards, it exceeds an acre by 60 yards. To determine an accurate acre, it may be measured 70 yards in length by 69 1-7th yards in width. The same result may be arrived at by measuring 220 feet in length and 198 feet in width, or by measuring 73⅓ yards in length by 66 in breadth.

But though the "statute" acre is 4840 square yards, the acre in different parts of England, according to the farmers' reckoning, varies from 2308⅔ square yards in Leicestershire to 10,240 square yards in Cheshire. Some of the other county measurements are: Wiltshire, 3630; Devonshire, 4000; Cornwall, 5760; Westmoreland, 6760; and West Derbyshire, 9000 square yards. A Scotch acre is 6150 and an Irish one 7840 square yards; while a Welsh acre is equal to two statute acres.

Similarly, a Scotch mile is 1984 yards, and an Irish mile 2240 yards, the English statute mile being, as in this country, 1760 yards.

Agricultural Experiments. — The importance of having the conditions precisely the same in carrying out most agricultural experiments is liable to be overlooked by many who try them. They are like the average servant-girl, who thinks that a little soda, more or less, cannot make any serious difference in the quality of her biscuit, though the difference may prove to be that between perfect success and hopeless failure. Or, to take another illustration, they remind us of the man who was asked, "What do you think of the theory of cutting off potato tops in order to force a greater yield?" "Why," was the reply, "it is all humbug; I tried it on three rows of my peas, and they never bore a pod."

The Cycle of Western Farming. — A writer in an Illinois paper says: "The average Western farmer toils hard early and late, often depriving himself of needed rest and sleep — for what? To raise corn. For what? To feed hogs. For what? To get money with which to buy more land. For what? To raise more corn. For what? To feed more hogs. For what? To buy more land. And what does he want with more land? Why, he wishes to raise more corn — to feed more hogs — to buy more land — to raise more corn — to feed more hogs — and in this circle he moves until the Almighty stops his hoggish proceedings."

Where Some of the Timber Goes. — It is surprising how much wood and timber are used annually in ways which at first sight appear absolutely insignificant. For instance, 500,000 cords of birch, beech, and maple timber are used every year in the manufacture of lasts, and the same quantity is used in making handles for small tools, and the match business uses up 300,000 cubic feet of the best pine.

A Female Farmer "Down East." — An agricultural exchange tells of a woman at Minot Centre, Maine, who has herself cut and yarded ten cords of sled-length wood this winter. She is a strong Scotchwoman, about thirty-five years of age. Her husband is living, but past hard work, being seventy years of age. She carries on successfully a large farm, doing nearly all the work herself.

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, MARCH 1, 1881.

PROGRESS IN ELECTRIC LIGHTING.

A striking illustration of the wonderful adaptation of means to ends in nature, and of human skill in research, is afforded in a discovery recently made, by which the electrical force is stored up for use when wanted. In the use of gas for purposes of lighting there must be a reservoir from which to draw a supply when the retorts are not in action, and hence the huge gas-holder is placed between the consumer and the works, and is a most important adjunct. If the consumer were supplied directly from the retorts, or, in other words, if the gas were consumed as fast as produced, the slightest disarrangement in the retorts would cut off the supply, and darkness would suddenly enshroud every dwelling.

In electric lighting, one of the great obstacles to success has been the want of some means of storing electricity, so that when the dynamo-machines ceased to rotate the flow of the current could be maintained for at least a short space of time. If a belt slips, or a valve ceases to act, in these machines during the hours in which lights are to be maintained, the incandescent carbons turn to blackness, and night instantly succeeds to the artificial day. Looking at the matter of storing electrical force as we store gas or water in the light of present scientific knowledge, the problem seems environed by difficulties impossible to overcome. It is easy to hold back gas or water, but electricity is a wild bull not to be kept in stall or pasture by any devices hitherto known to science; and yet the difficulty has been met successfully by M. Planté, a Frenchman, in the use of a secondary battery, which is placed between the dynamo-electric machine and the lamps.

This battery consists of plates of lead placed opposite each other, and very near together, though not touching. A Planté cell in fact consists simply of two pieces of sheet lead rolled up together and separated by the space of about one eighth of an inch. It has been found if these two lead plates are for a time connected with a generator of electricity (no matter of what kind), one of the lead plates is changed on its surface, it becomes oxidized, and after undergoing this change it is, when detached from the generator, in such condition as to be able to give out *at any future time* a current of electricity of its own. When the charge is expended, the plates are like an empty gasometer, in just the same condition they were before receiving the charge, and ready to be charged again. It is thus clear that if we place a series of these leaden cells in connection with a generator of electricity, the generator may be disconnected, and electricity will continue to flow so long as the supply lasts in the cells. Whilst this device does not at present quite meet the want, as a store of electricity on a large scale for practical electric lighting, it has in it the promise of meeting that want at no distant day.

The leaden cells have been charged or *filled* with the electrical force in the morning, and allowed to stand during an entire day, and at night the force has been utilized for all the purposes for which electricity can be used, thus showing that it can be held ready to be liberated when wanted. No discovery in any department of electric lighting is better calculated to inspire hopes of success than this. It proves that the greatest obstacles can be overcome, that there are resources in nature fully adequate to all our wants, and that we must never despair at meeting impediments which seem to hedge up the pathway of progress in practical science. This discovery when perfected may be found to remove one of the great objections to electric lighting, as it points out a method of storing electricity as illuminating gas is stored for use in a gasometer.

A DROP OF INK.

The item, "What is it?" published in the last number of the Journal, has greatly interested our readers, and puzzled many of them, as is shown by the enormous number of postal cards received. These cards have come from every State and Territory in the Union, from children and adults, and the answers are mostly correct. *Ink* is the wonderful agent which is capable of causing so much misery or producing so much happiness, as set forth in the puzzle. In looking over the postal cards giving replies (a work of no small magnitude) we seemed to be brought more directly into personal connection with our patrons than ever before. It is well to have sometimes a sense of personal intercourse with readers more distinct than is afforded by the ordinary routine of editorial work. As regards the answers, we wish we could afford to send a copy of the Journal for one year to every one who took the trouble to reply; but we shall have to supply it to *two* young persons, whose answers came first to the office at the same moment, from points not far from the city.

THE ASTRONOMICAL OBSERVATORIES OF THE WORLD.

According to the *Annuaire* of the Brussels Observatory for 1881, there are at present 118 public astronomical observatories in the world: 84 in Europe, 2 in Asia, 2 in Africa, 3 in Oceanica, and 27 on the American Continent. The United States are put down for 19, Mexico for 2, Brazil, Chili, Colombia, Ecuador, the Argentine Republic, and New Britain for one each. In Europe the country having the greatest number is Prussia, with 29; England comes next with 14; Russia has 12, Italy 9, Austria 8, France 6, Switzerland 4, Sweden 3; Holland, Norway, Spain, and Portugal, 2 each; and Belgium, Greece, and Denmark, one each. The oldest observatory now in operation is that of Leyden, founded in 1632. That of Copenhagen dates from 1637, Paris from 1667, and Greenwich from 1675. The oldest observatory of the New World is that of Rio Janeiro, founded in 1780.

The *Annuaire* (if correctly quoted in the foreign journal from which we have condensed the above) says that the next oldest observatory in America is "that of Chicago, founded in 1822" — or long before that enterprising city had an existence except as a frontier military post. No observatory in the country dates back so far as 1822. If we may believe Professor Loomis, the

first attempt of the kind was at Yale College, to which Mr. Sheldon Clark made a donation of $1200 in 1828 for the purchase of a telescope. An instrument of five inches aperture and ten feet focal length was bought and set up in the tower of one of the college buildings in 1830. The first astronomical observatory worthy of the name, however, was that founded at Williams College by Professor Albert Hopkins in 1836. The next was Hudson Observatory at Western Reserve College, Ohio, in 1838. The High School Observatory at Philadelphia was erected at about the same time, but the instruments were not received until the autumn of 1840. West Point followed hard after, the building having been erected in 1839.

The National Observatory at Washington may be considered as founded in 1842, when Congress made an appropriation of $25,000 for erecting "a depot of charts and instruments for the navy." A proposition had been made for the establishment of such an institution in 1807, but it met with no favor. John Quincy Adams, in his first message to Congress in 1825, refers to the fact that Europe has "upward of one hundred and thirty of these light-houses of the skies, while throughout the whole American hemisphere there is not one;" and he strongly urges that one be set up here. The appeal was received only with ridicule, and the plan of "light-houses in the skies" became a common by-word of reproach. The act of 1832, providing for a continuance of the coast survey, contained the proviso that "nothing in the act shall be construed to authorize the construction or maintenance of a permanent astronomical observatory."

The Cincinnati Observatory was planned in 1841, and the corner-stone of the building was laid by John Quincy Adams in November, 1843. At Cambridge there was a small observatory as early as 1839, but the present institution was not planned until 1843, and the great refractor was not mounted until 1847. Since that time the progress has been rapid, both in the establishment of new observatories and the better equipment of the earlier ones. The nineteen public institutions of the kind for which the *Annuaire* gives the country credit must include only the larger ones.

A "NATIONAL RADIANT" FLUID.

DURING the past month a "trial" was given in this city of an alleged substitute for kerosene oil, which is represented to cost much less, and be perfectly "non-explosive." The usual empirical experiments to prove the safety of this mixture were made, as lighting it with matches, dropping burning coals into it, etc. It is stated that the *base* of this new fluid is *naphtha*, with the addition of *thirteen* cheap ingredients. Among these are *potatoes, salt, alum, sulphuric acid*, and other substances, all of which might be replaced with soot or sand, so far as they prevent explosions. It may sometime become generally known that there is no possible substitute for good standard kerosene, and that naphtha is still dangerous, no matter how many vegetables may be stewed up with it.

This dangerous mixture is manufactured in Cleveland, Ohio, and it is said that a large quantity is to be put upon the market. Our readers will take warning, and give the new "National Radiant" oil as wide a berth as if it were so much nitro-glycerine. The only safe oil, as has been intimated, is standard kerosene; and it is in the end the cheapest, as doctors' and undertakers' bills foot up much more than any saving made in purchasing cheap naphtha under the name of "Radiant Fluid."

BITUMINOUS SHALE.

A SUBSCRIBER in Logan, Utah, has sent us a specimen of shale which is of considerable value as a gas-producing material. It gave upon analysis the following results: —

Water	0.57
Volatile hydrocarbons	23.41
Fixed organic carbon	20.16
Ash	55.86
	100.00

Our correspondent represents the deposits in Utah to be immense, — enough to meet all wants for ages, — and they are quite accessible. If the specimen submitted be a fair one, it is not quite rich enough in hydrocarbons to attract attention at present. The region where such deposits are found must be of interest to geologists, as it is probable that oil and coal are plentiful in the neighborhood.

GOOD WORDS FOR THE JOURNAL.

So many complimentary messages have come in with the annual remittances for the JOURNAL that we cannot refrain from quoting a few of them.

A physician in Illinois writes: —

During the past twenty years I have received a great many scientific periodicals, from weekly to semi-annual, but I could not do without the JOURNAL. I have occupied lecturers' chairs in chemistry in two of our best medical schools (at New Orleans and Louisville), and, with all the books and other publications at my command, I have found some of my most valuable information in your pages — a true *multum in parvo*.

A physician in Pennsylvania says: —

I get as much information from the JOURNAL for one dollar as I can from any other for five.

The widow of a physician in New York writes to assure us of "the very high regard" her husband had for the paper, "to which the carefully preserved and bound volumes of it in his library are witnesses."

A venerable practitioner in the same State writes as follows: —

I can't say that I shall be walking this earth when my present subscription expires, as I have got past the age usually allotted to man; but rest assured that so long as I live there will be no dissolving of partnership with the JOURNAL if I have a dollar in my pocket to pay the subscription. From the first number its monthly greetings have always been eagerly looked for.

This is from a Chicago man: —

I can't afford to be without it, and I would have it if I had to steal the dollar to pay for it.

A subscriber in Kentucky says: —

The JOURNAL is a household necessity and must be admitted to our chimney-corner still, as it long has been. May its usefulness increase, and the number of its readers multiply year by year!

This comes from a lady in Brooklyn, N. Y.: —

I am delighted with the first paper of 1881. Truth on chemical subjects is of vital importance, and the need has been and promises to be met by your invaluable monthly.

A high school teacher in this State bears the following testimony: —

I find it a valuable aid to me in teaching chemistry, physiology, and physics. A dollar thus invested yields a rich return.

A lawyer in Indiana writes thus: —

I regard the JOURNAL as the best periodical I receive for its price — indeed I am not sure that I ought to use the qualifying phrase. I have read it for years, and hope to read it for many more.

This is also from a lawyer in Pennsylvania: —

I find it the most valuable paper I take, and always learn something from every number.

A friend in Central Massachusetts says: —

I like it more than ever for its frank and unprejudiced treatment of the various topics which appear in its columns; and especially for its stand in favor of science which shall deal with the spiritual side of nature as well as the material.

This comes from Mississippi: —

During the ten years for which I have been a constant reader of the JOURNAL I have ever found it a faithful friend, and have never seen anything in it unworthy of its high character.

And this is from an Illinois lawyer: —

I can't do without the paper, one number of which is not unfrequently worth more than the cost for a year.

The following is from Alabama: —

It contains the most refreshing reading matter that I get, and it is the unanimous wish of all the members of my family old enough to read it that it may be *permanently* retained.

And this from farther off, in Texas: —

I believe I would rather do without my medical journals. My wife and children look for it when anything new comes up that we don't exactly understand. They say, "Just wait, the JOURNAL OF CHEMISTRY man will tell us all about it."

We might add hundreds more of these cheering testimonials from all parts of the country, but these must serve as specimens. We are grateful for the good opinion of all these kind friends, and shall hope to make the JOURNAL more and more worthy of their approval.

METEOROLOGY FOR JANUARY, 1881.

THE summary of observations on the weather for the past month has been as follows: —

Average Thermometer.		Lowest.	Highest.	Range.
At 7 A. M.	9.87°	-7°	37°	44°
At 2 P. M.	27.07°	8°	43°	35°
At 9 P. M.	19.61°	2°	38°	36°
Whole month	18.85°	-7°	43°	50°
Last 17 Januaries	22.70°	12.48° in 1867	32.98° in 1880	20.50°

The average barometer for the month was 29.975 inches; the lowest 29.41, on the morning of the 29th, and the highest 30.40, on the evening of the 19th, giving a range of .99 of an inch. The sum of the daily variations was 6.09 inches, an average daily movement of .196 of an inch. The largest daily movement, .54 of an inch, was on the 10th, in connection with a heavy rain of 3.35 inches, producing an unusual "slush" with previous snows.

The face of the sky in 93 observations gave 55 fair, 14 cloudy, 16 overcast, 2 rainy, and 6 snowy. The amount of rain, including 21 inches of melted snow, was 6.10 inches, while the average for the last 13 Januaries was only 3.90; the lowest, 1.80, in 1871, and the highest, 7.55, in 1878. The heaviest fall of snow was 10 inches, on the 21st and 22d, the severest storm of the season thus far. The sleighing was excellent for the most part through the month.

The direction of the wind, at the usual observations, gave an excess of 27 northerly and 76 westerly, over the southerly and easterly, indicating the average direction approximately to be west 20° 50′ north, nearly two points north of west, or W. N. W.

In general, it may be said that the month was severely and continuously cold, and yet the thermometer went below zero but four mornings (no evenings) during the month, at the usual hours. Only one January, that of 1875, has it been colder at this station for the last thirteen years, and then only by one and one third degrees. There was near me, however, on the morning of the 25th, a peculiarly cold wave, worthy of special notice. My locality is elevated some fifteen feet above the vale that runs north and south some twenty-five rods to the west of me. Along this vale, for 140 rods, beginning toward the north, at four different localities the

thermometer stood that morning at 17°, 13°, 13°, and 8° below zero, the latter in the midst of the village, while at my more elevated locality it stood at only 2° below, and thirty rods north of me, partly out of the valley, at 9° below. Two of these instruments were compared with my own, and when together agreed almost exactly. Other mornings the observations in the village often agree with mine, but more usually are two or three degrees below. Some allowance should doubtless be made for the different positions and exposures of the instruments, and also for the want of precision as to time; but, notwithstanding these, it is evident there must have been that morning a real difference of temperature of from 5° to 10° between this vale and my own situation, owing to a peculiar wave of cold.

The snow has been abundant for good sleighing during the month, and near its close averaged two feet in the pine woods though somewhat less in hard wood forests. In the open country it was driven into heaps by fierce, cold winds. After the "slush" on the warm and rainy 10th, the cold returned so suddenly that the ways were converted into solid ice, exceedingly rough and slippery. Nor have we alone suffered with extremely cold and stormy weather. The west and south have largely shared the same, if not greater severity. The storm on the 21st was peculiarly destructive in the vicinity of New York, prostrating a hundred telegraphic poles. Railroad travel was also interrupted, and in some cases whole trains were buried in the snow. In England also, and on the Continent, the cold and storms have been perhaps equally or even more severe. In England the snow accumulated in places to the depth of twenty feet, and was four or five feet deep in the streets of London. The Thames rose ten feet above high-water mark, flooding whole districts in the city, and causing damage to the estimated amount of ten millions of dollars. It was reported that "no such weather has been experienced within the memory of the present generation, if ever." Paris and Madrid have also suffered from similar causes, laying the latter city under one foot of snow, being "the severest snowfall experienced for thirty years." D. W.

NATICK, *February* 4, 1881.

EDITORIAL NOTES.

DICKINSON COLLEGE. — We have received, through the courtesy of the author, "A Sketch of Dickinson College, Carlisle, Pa.," by Charles F. Himes, Ph. D., Professor of Natural Science in the institution. It is a handsomely printed duodecimo of 155 pages, illustrated by engravings and by photographs executed in the college laboratory. The latter are good specimens of Willis's plantinotype process. The account of the scientific department is especially interesting, and might be studied to advantage by the managers of other colleges, few of which are so fully up with the times, either in the amount of work done, or the excellence of the methods adopted. Dickinson College established a chair of natural philosophy and chemistry as early as 1810 — the first recognition of chemistry as a science — and Dr. Thomas Cooper, who filled it from 1811 to 1815, was a friend and fellow-student of Priestley, some of whose apparatus — a burning-glass, telescope, and air-gun — he was the means of adding to the college collection. From this early and good beginning the department has been active and progressive ever since, and is now looking forward to enlarged facilities in the way of buildings, apparatus, and instructors for its rapidly increasing work. It is to be hoped that, through the liberality of its friends, its wants in this respect will be fully met before the Centennial of the college in 1883.

ENGLISH ROADS. — Mr. A. D. Chandler, of this city, in an entertaining account of a bicycle tour in England, which he is writing for the *Bicycling World*, refers as follows to the variable quality of English highways: "From Swing-Gate Inn to Dover was the most extraordinary bit of road we had met with. The mud, a whitish compound of limestone and water, was so deep that we were forced to dismount and climb along a ridge by the fence at one side for a long way; it was with difficulty that vehicles were dragged through. For such neglect of a road a New England town would be in danger of being indicted; but before we left England we discovered that the popular notion of the universally good condition of roads there is quite at fault. Not only in Kent, but in Oxfordshire, Yorkshire, and elsewhere, we passed over miles of execrable roads, on which, if we kept in the saddle, we suffered from side-ache, and where we often had to dismount and walk. Yet it is true that for touring on bicycles England offers facilities such as can by no means be obtained generally in New England, and for many a score of miles have we ridden over superb English roads, passing mile-stone after mile-stone quickly and easily."

LUMINOUS INK. — An Italian correspondent of the London *Daily News* is responsible for the following, which is not incredible on the face of it: "A new invention is reported from Turin. It consists in the application of light-giving materials to printing ink, by which print becomes luminous in the dark, so that in future it will be possible to read at night, in bed, or during a journey, without the assistance of candle or lamp. A new daily paper, in which this luminous material will be used, is, it is said, about to be published at Turin."

A VENERABLE LUNATIC. — At the Parisian asylum of Bicêtre there died recently, at the age of 103, a patient named Jubissier who had been an inmate of that establishment ever since 1797. When eighteen years of age he received a serious injury to the head by the fall of a piece of glass. The wound took a considerable time to heal, and produced an affection of the brain, which developed into incurable insanity, and led to his admission into Bicêtre. When the delirium by which he was afflicted had become assuaged, it left him with the fixed idea that his body was composed of glass. Haunted by this belief he is said to have scarcely moved during the eighty-three years he passed in the asylum, and to have only opened his lips intelligently once during that period, to ask for tobacco. During the Franco-German war his intellect seemed moved into temporary activity by the explosion of the shells; but he quickly relapsed into the silence and immobility which had previously characterized his existence.

ATOMS.

THE Vienna Academy of Science proposes as the subject for the Baumgartner prize of 1000 florins the microscopic investigation of the wood of living and fossil plants, in order to ascertain whether it is possible to determine with certainty from the examination of the microscopic sections, what the genus and species of the plant may have been from which they were taken. — Mr. Medhurst, a British official in China, stated recently that 53,000 lbs. of willow leaves were being made ready to be mixed with teas at one port alone. — Dr. L. Wolff contributes to the *Pharmacist* a paper on "Pharmacocatagraphologia," which expressive word is supposed to mean the art of writing prescriptions. — The recent hurricane in Jamaica damaged or destroyed some 10,000 cinchona-trees and over 400,000 seedlings. — The Medical Committee of Middlesex Hospital, London, report, after long trial, that Chian turpentine is useless in cancer. — A Western journal says: "A man at Dutch Flat picked up a rock, the other day, to throw at a cow; the weight of it attracted his attention, and on examination it was found to contain over a hundred dollars in gold." — The quantity of salt contained in the sea (according to the best authorities) amounts to four hundred thousand billion cubic feet, which, if piled up, would form a mass 140 miles long as many broad, and as many high; or, otherwise disposed, would cover the whole of Europe, islands, seas, and all, to the height of the summit of Mont Blanc, which is about 16,000 feet in height. — Professor Chevreul has just completed, at the age of ninety-five, a course of forty lectures on chemistry; but, if he lives to the age of one hundred and five, as his father did, he may give several courses more. — An exasperated Pennsylvania farmer, who had lost a great number of sheep, placed some poisoned meat where he thought it would do the most good: his rage was considerably soothed, next morning, on finding the dead bodies of eighteen sagacious dogs. — The first Hereford cattle brought into this country were imported in 1815, by Henry Clay, and were kept on his farm at Lexington, Kentucky. — The first author on record who studied the relation between the habitual occupation of men and their physical and mental health was Bernardini Ramazzini, who published a treatise, "De Morbis Artificum," at Padua, in 1713. — At the forthcoming electrical exhibition in Paris, several electrical railways will be at work, the most imposing being a large one in the British portion erected by Siemens Bros.; a steam-engine of 800 horse-power will be provided for working the electric light, the number of lamps, of all kinds, being estimated at 600.

LITERARY NOTES.

MR. D. VAN NOSTRAND has just published *Electric Lighting by Incandescence*, by Mr. W. E. Sawyer. It is an octavo of 189 pages, with 96 illustrations ($2 50), and gives a good account of the present state of the art, especially in its practical applications to interior illumination. Considerable space is devoted to the description of the leading electric generators. Lighting by means of the voltaic arc is not dwelt upon, as this is fully described in the text-books, and is already familiar to most readers. The author is himself a worker in this department, but does full justice to other experimenters and inventors.

A new edition of Clowes's *Practical Chemistry*, from the third English edition, has been issued by Henry C. Lea's Son & Co., Philadelphia. We have before commended it as a compact manual of qualitative inorganic analysis, well suited for class use or for the private student. The book has been carefully revised throughout, and some processes have been materially simplified.

The Young Folk's Cyclopædia of Persons and Places, edited by J. D. Champlin, and published by H. Holt & Co., New York ($3.50), is a companion volume to the *Cyclopædia of Common Things*, commended some time ago in the JOURNAL, and is worthy of the like praise. It is an illustrated octavo of 920 pages, and for young people, at home or in school, is likely to be more useful than the larger dictionaries of biography and geography. It might, indeed, supply the place of those for older people who cannot afford to buy them. It is full, accurate, and in all respects well edited.

Macmillan & Co. send us *Food for the Invalid*, by Drs. J. M. Fothergill and H. C. Wood ($1.00), a brief handbook of hints and recipes for the food of "the convalescent, the dyspeptic, and the gouty." The recipes are nearly three hundred in all, and the preface suggests that by marking such of them as a physician may deem desirable, and leaving the book with the nurse, time may be saved and a full dietary provided for the patient. It may be found, with the other books noticed above, at Williams & Co.'s.

A useful little book for teachers is the *Easy Experiments in Chemistry and Natural Philosophy*, by Mr G. D. Lind, published by Mr. J E. Sherrill, Danville, Ind. (40 cents). Its special aim is to help those who have to get along with simple and cheap apparatus, or such as they can make for themselves. The experiments are well chosen, and so clearly and minutely described that no one can find any difficulty in performing them. An appendix gives some hints on the preservation of natural history specimens.

The *Illustrated Scientific News* has passed into the hands of Munn & Co., of the *Scientific American*, who will continue to publish it, but in enlarged and improved form, as a monthly, at $1.50 a year.

The *Botanical Gazette*, edited and published by J. M. and M. S. Coulter, Crawfordsville, Ind., at $1.00 a year, is a neat little monthly, now in its sixth volume, and well worthy the attention of all students of botany. The January number, among other interesting matter, describes some curious experiments with carnivorous plants.

The juvenile paper, *Golden Days*, published weekly by James Elverson, Philadelphia, at $3.00 a year, has entered on its second volume, and continues to maintain its high character for furnishing attractive and unexceptionable reading for the young.

Medicine and Pharmacy.

WHAT TO DO WHEN AT A LOSS.

UNDER this heading the *Philadelphia Reporter* compiles from various sources some excellent hints for the practitioner. — Dr. Weir Mitchell has remarked that a malady at its commencement only gives faint indications of its nature, — the first letter or two of a word, as it were, — and the physician must wait patiently for other symptoms before he can hope to diagnose the case with confidence. But the patient expects him to do something meanwhile, and he must not seem to be in perplexity. The first rule is to *enjoin rest.* This is in any case the most essential aid to treatment. But the patient will not be satisfied with that treatment alone. The doctor is expected to give something. Then comes in a good rule, the author of which is Dr. Robert Barnes, — *When in doubt, give salines.* He says there is hardly any disease in which these will not do good in the beginning, nor hardly any in which they can possibly do harm. The next rule is to *relieve any organ functionally disturbed.* This rule must be followed, however, with discretion. It is not always wise to purge when the bowels are constipated. An engorged liver is most promptly relieved by stimulating the functions of the kidneys, and so on. Fourthly, *Avoid committing yourself.* This is obviously a great part of the tact of a skilful physician. He must not express a decided opinion before he is quite convinced, nor must he let it be seen that he has none. Lastly, he must always bear in mind the maxim of Hippocrates, *Do no harm.* This should guide, and indeed precede, every other idea. Mr. Francis Galton, in his "Art of Travel," quotes a satirical remark to the effect that there is a great difference between a good physician and a bad one, but very much less between a good physician and none at all. This is only another way of putting the advice last given.

VULCANIZED RUBBER IN DENTISTRY.

SIXTEEN years ago Dr. W. B. Roberts, of New York, wrote as follows in the *People's Dental Journal:* —

"We discovered that of the red vulcanite, commonly used by dentists, no less than one third consisted of the coloring matter, bisulphuret of mercury, or the vermilion of commerce; and that the balance was composed of sulphur and rubber, in nearly equal parts. Medical testimony informed us that the bisulphuret of mercury produces the same effect upon the system as pure mercury; we also found that in the process of mixing these ingredients none of their properties are lost; and by actual experiment, before and after vulcanizing, the weight of the substance is the same.

"It therefore became evident to us that the bisulphuret of mercury and sulphur — two substances confessedly injurious to health — were actual ingredients of the material when placed in the mouth; and common sense as well as science taught us that such effects as were perceptible in such mouths could proceed from no other cause.

"These effects, as noted in our own experience, and declared by the evidence of many others, were, first, a great absorption of the alveolar and bony substance of the jaw; next, irritation of the mucous membrane, and a condition nearly approaching salivation; then gastric irritation, and finally the general derangement of the health consequent upon such abnormal conditions.

"All of these symptoms of disease were removed by simply removing their obvious cause, *red vulcanite;* while a healthy condition continued after replacing it with gold, or continuous gums.

"One cause of these inflammatory conditions under red or any color of vulcanite is the fact that it is a non-conductor of heat, and this cause, as will be apparent to any physiologist, is sufficient to produce the worst results."

Dr. L. P. Haskell, in the *Chicago Medical Journal* for January, 1881, commenting on the above, says: —

"To this testimony of Dr. Roberts has been added sixteen years of experience all over the world — we may say universally — of the dental profession. Doubtless there are many dentists who are unaware of these facts in relation to vulcanite, especially among that class who commenced practice since its introduction, and have had little or no experience in the use of *metal* plates. . . . .

"It will be observed that there are two serious objections to the use of these materials: loss of bony substance from undue absorption, caused by the retention of heat under the plate; and the *poisonous* effects of the coloring material, which constitutes *one third* of the whole plate.

"The first of these is the least serious of the two, but affects all who wear it, only in different degrees. I never have yet seen a mouth where this material has been worn but there were evidences of undue absorption, and thousands of mouths are ruined by it, for absorption goes on until there is no 'process' left, and no ridge, or only a flexible one of thickened membrane. To a young or middle-aged person, doomed to wear artificial teeth the balance of their days, it is certainly desirable that as permanent a condition of the *ridge* should be maintained as possible. There is undue absorption under metal plates, sometimes, but owing, most always, to undue pressure, long continued, upon one portion of the jaw. The effect produced by the coloring material is far more serious, although not so often realized, because it seriously affects the health of the patient."

Dr. Haskell goes on to give the details of several cases within his own observation that illustrate and confirm these statements. We have not space for this portion of his paper, but we commend it to dentists and other professional readers who may wish positive evidence of the injurious effects ascribed to the vulcanite.

THE DETECTION OF ARSENIC IN WALL PAPERS.

DR. W. B. HILLS, in the *Boston Medical and Surgical Journal* of January 13, 1881, has an article on this subject, in which he shows that the nitrate of silver test is not reliable in all cases. It may be depended upon when arsenite of copper (Scheele's green), or aceto-arsenite of copper (Schweinfürth green), is used alone as a pigment; but not when, as often happens, these are mixed with other substances for the purpose of modifying the green color and obtaining various tints. The test is also useless when the yellow sulphide of arsenic is used, as is sometimes the case. In fact, arsenic occurs in papers in so many different forms that a more trustworthy means of detecting it is a desideratum. This Dr. Hills believes to be supplied by the following method: —

Take a sample three or four inches square (less will suffice with plain papers), cut into small pieces, moisten with concentrated sulphuric acid and heat carefully till the paper is thoroughly charred. Let the charred mass cool, add to it about one fluid ounce of water, grind the black mass fine that the water may come in contact with all parts of it, filter and wash. The arsenic will be found in the filtrate, which is examined by Marsh's test. All chemicals must be free from arsenic. A paper which, treated carefully in this manner, furnishes no arsenical mirror on porcelain does not contain any appreciable amount of arsenic.

CARBOLIC ACID FOR COLDS AND COUGHS.

A LADY subscriber of the JOURNAL in Lynn, Mass., sends us the following note, which appears to sustain the views expressed by our Boston correspondent last month: —

Among other interesting things I find in the February number an article on carbolic acid. I also read the one published in 1878. I think it was about ten years ago that I began to have serious trouble with my throat, especially at night. Whether I had a cold or not, there was a constant irritation, which caused tickling and strangling on lying down. I tried various things, but nothing did much good, until I began to use "Edey's Carbolic Troches." I found that by putting one in my mouth, on going to bed, the tickling was prevented. For a long time I did not know that they would be useful for colds, as I had the idea that carbolic acid was a dangerous poison, and dared not use more than one troche at a time, nor oftener than once an hour; but, finding *my* cough relieved, I ventured to give them to my children for the same trouble, and with the same caution. One night one of my children, a boy nine years old, was coughing a good deal, and, to save myself the trouble of getting up every hour to give the medicine, I put the box (a full one) under his pillow, that it might be ready whenever I ordered him to take a dose; and that was the last *I* knew of the matter until morning. The boy took the *boxful* in the course of the night, and routed a fearful cold by the means; not a sign of it was left in the morning. A more frightened woman is not often seen than I was for a few minutes; but I soon found that not the least harm was done. In this way I learned that a cold could be cured by the troches, but hardly considered it safe to take a boxful for a dose. I found, by trial, that *one* troche would banish a cold, if taken when the very first symptoms appeared. If the cold got under way before it was possible to use the remedy, I ventured to give two at a time, at intervals of half an hour. But, in a family where at least three of its members are subject to influenza in its most excruciating form, the expense of keeping a supply of troches was a heavy one; I did not know how to afford it, so I concluded to experiment on myself with the solution. I found that by adding four parts of water to one of the acid I got about the same strength; judging of course by the taste that the troches had. I used one teaspoonful per hour, and found it would do all the troches would do. For three years I have used this preparation, and consider it the best thing I ever saw or heard of.

Not long ago, I found that I had taken a severe cold, but had no carbolic acid in the house. By the time I got it I was in a wretched state, and, feeling desperate, I began to take my medicine at the rate of *two teaspoonfuls once in ten minutes*; but not until I had taken it all day in this way did my cold yield. Then there was an end of the whole thing; not a sign of it the next day, nor any bad effect from taking such a quantity of the acid. Since then I take it myself and give it to my boys without the least fear of bad effects.

THERAPEUTICAL HINTS.

Treatment of Sulphuric Acid Burns. — M. Alanore, a pharmacist of Clermont-Ferrand, relates in the *Union Pharmaceutique* the details of an accident by which two students in chemistry received a quantity of sulphuric acid on their faces and clothing. The professor brought them to M. Alanore's pharmacy, and he as quickly as possible covered their faces with a soft paste of calcined magnesia and water, about two millimetres thick. He continued to apply more as this fell off. In a quarter of an hour both were free from pain, but the treatment was continued in one case for five hours, in the other for twenty-four hours. When they were able to bear the air without any pain it was found that no mark of the burn remained except a slight redness, which entirely disappeared in the course of a week or two.

External Use of Castor Oil. — Mr. McNicoll and Dr. Hilliard report in the *British Medical Journal* that they have found purgative results follow the inunction of castor oil. The latter says: "I have frequently applied castor oil to the abdomen, under spongiopiline, or other waterproof material, in cases where the usual way of administering by the mouth seemed undesirable, and with the happiest results. Within the last few days, in a case of typhoid fever, I applied half an ounce of castor oil in this manner, under a hot-water fomentation, which relieved the constipation and tympanitic distention that had been present, without undue purging or irritation of the bowels."

For Phosphorus Poisoning. — According to the *Birmingham Medical Review*, a certain antidote for phosphorus poisoning is carbonate of magnesia in drachm doses every fifteen minutes, until no odor of phosphorus is perceptible in the breath. The phosphorus combines with a portion of the magnesia; and the uncombined magnesia, by its mechanical action, protects the coats of the stomach from any further action of the phosphorus, and any free phosphoric acid is neutralized by it as it is formed.

Inhalation of Carbolic Acid in Respiratory Diseases. — Dr. Robert Munro, in the *Glasgow Medical Journal*, reports a series of cases of phthisis and chronic bronchitis in which very decided and favorable results followed frequent inhalations of vapor of boiling water containing carbolic acid. Cases of fibrous phthisis and of chronic bronchitis in which there was excessive expectoration were especially benefited thereby. An inhaler, although convenient, is not essential, a pitcher or jug holding boiling water being all that is needed, and care must be taken to use it several times in the day and to inhale completely the rising vapor — not, merely draw it into the mouth. The editor of *New Remedies* states that he has had an experience with a similar use of the remedy, which enables him to indorse what Dr. Munro says of its efficacy.

Borax in Hoarseness. — According to *La France Médicale* this salt has been employed with advantage in cases of hoarseness and aphonia occurring suddenly from the action of cold. The remedy is recommended to singers and orators whose voices suddenly become lost, but which by these means can be recovered almost instantly. A little piece of borax, the size of a pea is to be slowly dissolved in the mouth ten minutes before singing or speaking. The remedy provokes an abundant secretion of saliva, which moistens the mouth and throat. This local action of the borax should be aided by an equal dose of nitrate of potassium, taken in warm solution before going to bed.

NOTES FROM ABROAD.

Honor to a Hero. — A recent London journal says: The Queen has been graciously pleased to confer the Albert Medal of the Second Class o Surgeon Henry Grier, Army Medical Department. The following is the account of the services in respect of which the decoration has been conferred: On August 26, 1880, Lieutenant Graham, 10th Regiment, was dying of diphtheria, when Surgeon Grier performed upon him the operation of tracheotomy, and observing that no attempt at inspiration followed applied his lips, without a moment's hesitation, to the wound, and by suction, at the imminent risk of his own life, restored to the patient the power of breathing. Lieutenant Graham's life was thus saved for the time, although, unfortunately, on the following day the disease extended to his lungs, and he died. It is satisfactory to find that her majesty has been as prompt to recognize the self-sacrifice of Surgeon Grier as the French Government were, upon a recent occasion, to decorate a young French doctor who had performed a somewhat similar action.

Influence of Music on the Circulation of the Blood. — According to the *Lancet*, Dr. Dogiel has made some studies on this subject, from which he concludes: (1.) That music has an influence on the circulation of the blood. (2.) That it sometimes raises and sometimes depresses the blood pressure. This influence is brought about by the reflex action of the excited auditory nerve upon the medulla oblongata. (3.) Generally the heart beats faster, the automatic motor ganglia being stimulated. (4.) Strychnia increases the effect of music; curare lessens it. (5.) The effects vary with the pitch, loudness, and tone of the music.

Statistics of Medical Journalism. — On the authority of M. Dureau, one of the librarians of the Académie de Médecine, the present number of medical periodical publications for France and its colonies is 147, 95 of these being published in Paris, and 52 in the departments. The Germanic Confederation publishes 133 journals, Great Britain 69, Austria 54, Italy 51, Belgium 28, Spain 26, Russia 26, Holland 16, Switzerland 10, Sweden and Norway 9, Denmark 5, Portugal 4, the Danish Principalities 4, Turkey 2, Greece 1, — the total for Europe being 583. In America there are 183 journals, in Asia 15, in Oceanica 4, — the total for the various continents being 785. The number of medical journals created since 1679 exceeds 2500.

New Remedy for Epilepsy. — Not an overnice remedy is magpie dust, which no less a personage than the Princess Bismarck apparently deems an infallible specific for epilepsy, since no longer ago than January of last year the president of the Eckenfoerder Shooting Club addressed the following circular to the members of that association: —

"Her Highness Princess Bismarck wishes to receive before the 18th instant as many magpies as possible, from the burned remains of which an anti-epileptic powder may be manipulated. I permit myself, therefore, high-and-well-born sir, to entreat that you will forthwith shoot as many magpies as you can in your preserves, and forward the same to the Chief Forester Lange, at Friedrichsruh or hither, without paying for their carriage, down to the 18th of this month."

Odium Scientificum. — The calm cold atmosphere of scientific discussion does not appear to prevent that heated state of feeling formerly supposed to be the peculiar weakness of theologians. At a recent meeting of the Paris Académie de Médecine, Professor Pasteur's course in keeping secret one of his scientific discoveries was animadverted upon by Professor Guerin, whereupon Pasteur said, cuttingly, "When, in the name of clinical principles, a man has proposed to aspire pus to the surface of wounds by means of an india-rubber cap, some tubes, and a pneumatic pump, he is capable of anything." These personalities nearly ended in a duel, the rumor of which, it is said (owing to the fact that one of the would-be combatants is nearly an octogenarian, and the other hemiplegic), caused some hilarity in the Academy.

The Chinese as Patients. — An English physician writes from Formosa: "The Chinese make, on the whole, very good patients. Occasionally some of them try our patience not a little. One gets a four days' supply of medicine away with him, the recipe bearing on it, 'A spoonful three times daily after each meal.' He comes back next morning for more, thinking to flatter you by stating that he drank the former quantity at one dose. Another has his arm carefully put up in splints, and on his next visit he brings his dressings in a separate parcel. They are great believers in internal administration, and although he have only a cut finger it is difficult for a Chinaman to see why he should not get some medicine to 'eat.' They have peculiar palates, many of them, and can drink castor-oil *ad nauseam*, a stage which is not so easily reached in their case as it is in ours."

Tanner Outdone. — *L'Union Médicale*, September 4th, reproduces a paper originally published in 1831, by Dr. Desbarreaux-Bernard, narrating the case of a murderer who died in the prison of Toulouse in consequence of an abstinence prolonged during sixty-three days, in order to escape public execution. The exactitude of the statements seems beyond doubt, as the man's case excited great attention among the profession of Toulouse during its progress, and the account of it was read by the author at the medical society of that town. At first efforts were made to feed him forcibly, but his violence was so great that these were abandoned, and only ineffectual persuasion was resorted to. He from time to time took a few drops of water, and on some occasions drank very abundantly of this, — the whole quantity which he took during the sixty-three days being approximately calculated at from five to six litres.

The Death of Cavendish. — The eminent chemist, Cavendish, was remarkably reticent and shy. When about to die he rang his bell, and said to the valet who answered the summons, "I feel very ill, and am going to die. Come again in half an hour." The servant, with pardonable anxiety, returned before the time appointed. Cavendish, who was still alive and sensible, observed, with some severity, "You have disturbed my last moments. You will please return at the time I ordered." The man returned, and found Cavendish dead.

Tobacco in Germany. — The number of cigars smoked in Germany in a year is estimated at about 6504 millions, representing a constant and daily consumption of two cigars per head for 10 million smokers. Besides cigars, the Germans smoke, during the same period, more than 60,000 tons of tobacco, which has undergone more or less preparation; besides using 8000 tons of snuff and 700 tons of tobacco for chewing.

SELECT FORMULÆ.

The Care of the Hair. — Dr. C. Henri Leonard, in his excellent book on "The Hair," remarks: "The adult scalp should be thoroughly washed as often as once a month, at the very least. A daily brushing will not suffice the scalp, except when dried down with dust, and brushing does not remove the oily particles from the scarf-scales of the skin.

"One of the best cleaning substances I know of, for either male or female to use, is the yolk of an egg. This should be well rubbed into the roots of the hair and upon the scalp; then the whole washed out with tepid water and Castile soap, rinsing with clear, cold water. This done, the hair should be thoroughly dried by brisk rubbing with towels,

so as to get a roseate glow to the scalp, thus bringing a larger supply of blood to the hair papillæ; if found too dry, a little pomade could be applied. The cocoanut oil is probably the best of any. Purified beef's marrow could also be made use of, though vegetable oils are the best to use, as they are less apt to become rancid."

As a hair tonic Dr. Leonard recommends the following: —

℞ Tr. cantharidis	℥ss.
Tr. capsici	℥ss (j).
Ol. cocoæ,	
Ol. ricini	ää ℥i.
Spt. myristicæ,	
Aq. Cologniensis, q s. ad	℥ iv. M.

Sig. Shake well. Apply once or twice daily

Extractum Rhei Aromaticum Fluidum. — Recommended by the Pennsylvania Pharmaceutical Association for the new U. S. Pharmacopœia: —

	Oz.
Rhubarb (in moderately fine powder)	6
Cloves (in moderately fine powder)	2½
Cinnamon (in fine powder)	2½
Nutmeg (in fine powder)	¾
Stronger alcohol	6
Water	6
Glycerine	5

Prepare by percolation *secundem artem*. One ounce of this fluid extract and 15 fl. oz. of syrup will make one pint of aromatic syrup of rhubarb.

For Phthisical Cough. — Dr. T. F. Pearse recommends the tincture of gelseminum sempervirens in twenty-five-minim doses three times a day. He generally prescribes it with dilute phosphoric acid. If there be much expectoration, compound tincture of benzoin is often useful.

Mr. T. Garrett Horder strongly advises hydrobromic acid in doses of twenty minims. It may be given with the addition of spirits of chloroform. He has also found the inhalation of the vapor of iodine very useful in chronic cough.

Another correspondent recommends fifteen minims of hydrobromic acid and ten minims of chloric ether in a dessertspoonful of water four or five times a day, with a pill containing a quarter of a grain of codœia three times a day.

MISCELLANEA.

The Country Doctor in England. — Those who have not travelled abroad are apt to think that such sparsely settled regions as we are familiar with almost everywhere in this country are unknown in England; but they are not uncommon in many rural districts there. Dr. J. M. Fothergill, in one of his pleasant letters to the *Philadelphia Medical Times*, quotes from a friend in Somersetshire the following to give an idea of what "country practice" is in some parts of England: "As an example of our seclusion, I may relate an instance. My predecessor was attending a family (on a lonely moor) with diphtheria. The day after he saw them a heavy snowstorm came on, and, on making the attempt to reach the house, he failed, owing to the deep snow-drifts. He managed six miles, but the remaining three baffled him. A whole village set to work, and in five or six days cut a narrow path for him and his horse; but on his arrival he found four or five corpses in the house. Another example: Last winter, in a snow-storm, my colleague was sent for to a lonely house twelve miles off. He sent his assistant, who came back with the news that an operation for strangulated hernia was required. Next day my colleague and his assistant rode the twelve miles through the snow, and reached the house in the afternoon. As it was growing dark, they asked for candles, to afford sufficient light for the operation; but a messenger had to walk a distance of six miles over the snowy moor to the nearest village before he could get light sufficient for the operation. The delay, I regret to say, was against the success of the case, and the patient died."

Rapid Breathing as an Anæsthetic. — We have referred in the Journal to Dr. Bonwill's method of producing anæsthesia by rapid inspirations. Dr. Henry Gibbons, of San Francisco, says of it, in the *Pacific Medical Journal*: "We suppose that most persons — most boys, at any rate — have experienced the sensation produced by blowing at a fire, substituting their lungs for a bellows. The proposed method is nothing more than an exaggeration of this. So far from regarding it as likely to prove useful, we look upon it as decidedly dangerous. It puts the brain in an abnormal condition by interfering with the circulation, and is almost equivalent to partial strangulation. We are surprised that any considerate physician should recommend such a violation of physiological laws."

The Largest Man in America. — The largest man on this continent was the late Lewis Cornelius, of Pike County, Pa. He was considerably larger than Daniel Lambert. Mr. Cornelius's dimensions are entered upon the record books in the prothonotary's office at Milford, Pike County, as follows: —

"Lewis Cornelius: born, 1794.

"Height, 6 feet.

"Circumference below waist, 8 feet 2 inches.

"Circumference above waist, 6 feet 2½ inches.

"Circumference of arm above elbow, 2 feet 2 inches.

"Circumference of arm below elbow, 1 foot 9 inches.

"Circumference of wrist, 1 foot 3 inches.

"Circumference of thigh, 4 feet 2 inches.

"Circumference of calf of leg, 2 feet 7 inches.

"Circumference of ankle, 1 foot 7 inches.

"Weight without any clothing whatever, 645¼ pounds."

This is the only authentic record of Mr. Cornelius's size extant. As he had been sick some time, he lost over 50 pounds of his weight. He was not weighed until after his death, and when in full health would have tipped the scales at 700 pounds. His wife was a very slight woman, and weighed just 100 pounds.

A Magnetic Probe. — Dr. J. H. Bill, U. S. A. in the *American Journal of Medical Sciences*, describes a very ingenious magnetic probe for the detection of iron missiles lodged in the tissues, which promises to be as useful as Nélaton's probe for leaden bullets. The application depends upon the principle that when a magnet touches a piece of iron or steel, an induced current of electricity is developed which may be made applicable by the aid of the audient of the telephone as an indicator.

FACETIÆ.

Bishops and Doctors. — The Bishop of Liverpool, in a recent speech at a meeting of medical men, remarked with a charming combination of tact and humility: "I am not ashamed to say I have a son who is a doctor;" whereupon *Punch* touches up his lordship as follows: —

"How kind of the bishop and how patronizing,
And yet to his *Punch* 't is a little surprising
That speaking to medical men there in session
He dared speak of shame and a noble profession.
A bishop looks after our souls, but how odd is
The sneer that 's implied at the curers of bodies;
For surely it would be no hard task to fish up
A hundred brave doctors as good as the bishop."

The Wonders of Telephony. — *Punch* has the following, which is good enough to be true: The Principal (from the city, through the telephone, to the Foreman at the "Works"): "How do you get on, Pat?" Irish Foreman (in great awe of the instrument): "Very well, sir; the goods is sent off." The Principal (knowing Pat's failing): "What have you got to drink there?" Pat (startled): "Och! Look at that now! It 's me breath that done it!"

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Drug Stock For Sale. — Small, well-selected stock of Drugs, Fixtures, etc., etc., together with good-will of an established business, located opposite depot, in Palestine, Texas, will be sold on reasonable terms. For further information apply to Dr. L. A. Walker, at the store, in Palestine, or to the owner, W. C. Robards, at San Antonio, Texas.

R. & J. Beck, Opticians, of Philadelphia, whose advertisement appears on page 8, of the Journal, are one of the leading houses in this branch of business in this country, and have established a well-deserved reputation for their goods.

Curt W. Meyer, 182 Broadway, New York, has published a very nicely illustrated and descriptive Catalogue of new designed apparatus for students' use in physics and chemistry. See advertisement on page 2.

For Sale. — First-class residence and good will. Established *ten years*, price $3,000. Address P. O. Box 429. J. L. Cady, M. D., Niles City, Mich.

Sound travels at the rate of about 1100 feet in a second, while the light from one of Esterbrook's nickel-plated pens takes no appreciable time.

Wm. M. Townley, of Newark, N. J., is filling large orders for his Pass Dyes for Easter Eggs. These dyes are very neatly put up in boxes containing sample eggs; also samples of Worsted, Silk, Feathers, etc., showing the different colors. The dyes are not poisonous, consequently the eggs can be eaten without fear of poisoning. See his advertisement on page 5.

An Old and Valuable Remedial Agent. Elixir of Peruvian Bark with Protoxide of Iron. — It has been supplied to physicians since 1856, and has been more favorably received by the profession than any other of the Iron combinations. For an Aromatic Cordial Elixir, pleasant and acceptable to all classes of patients, Nichols & Co.'s Elixir Peruvian Bark and Iron is highly recommended. The ordinary forms in which Iron has been presented are generally disagreeable to invalids; they are inky, astringent, or leave an intensely metallic taste in the mouth. These objections seem to be obviated in the Bark and Iron; and we believe the most sensitive and fastidious in matters of taste commend the elegance of the preparation.

International Medical and Sanitary Exhibition, to be held at London during the International Medical Congress, 1881.

For particulars and forms of application for space, apply to the Secretary, Parkes Museum of Hygiene, University College, London. Application for space must be made before March 31st. From India, the Colonies, and America, applications received up to April 15th.

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Familiar Science.

SOME OF OUR ILLNESSES.

OUR illnesses arise from a variety of causes, and when we consider how many agencies of evil are at work to undermine health, the wonder is that we escape disease as well as we do. Sickness of any kind is simply chemical disarrangement of bodily organs or functions, or mental disturbances, which concern the brain and nerves. We live in a peculiarly constructed house, a house complicated in every part, but exceedingly well adapted to our wants. As regards the materials of the structure, there is nothing about them very stable or peculiar. Apart from the bones, the human body is nothing more than a few pounds of earthy salts and animal tissues suspended in five or six buckets of water. The bones, the only solid portion, in no respect differ from our marble wash-basins and mantels, save in the amount of phosphoric acid they contain. So far as materials go, we have nothing in our tabernacle of flesh to boast of; but the unstable molecules are arranged in a marvellous manner, and, being subject to chemical laws and changes, like all organized matter, they often change places and assume new forms in an abnormal way. If we could contrive to keep chemical and mental action always under normal conditions, we should never be ill; we should die of old age, like the perfect combustion of a candle, which dies out for the want of more wax or paraffine. Whether it was originally designed that we should never be ill — that death, barring accidents, should result from the exhaustion of old age — is a question we may discuss and consider, and never reach any positive conclusions. We find ourselves existing in a world governed by law, and from the exactions of law there is no escape. There is one law which requires us to be temperate in eating and drinking, another requiring us to hold in check our passions, another demanding that we protect ourselves from changes of temperature, and that we avoid external agencies which disturb the equilibrium of chemical forces; indeed, there are many laws, the violation of any one of which causes illnesses more or less severe.

Sudden "colds," so called, originate a formidable array of illnesses, many of which terminate fatally. What is a cold? This term is one well understood, and, in a popular way, means any illness resulting from changes in the temperature of the body or any of the organs. A cold is a disturbance in the circulation; the blood is turned away from its normal circuit, the functions of the skin are suspended, the heart's action is quickened, and the temperature of the body is elevated. The troubles are of a serious nature, if not promptly attended to. That wonderful fluid, the blood, is an important factor for good or evil in the human organization, and it is very sensitive to changes of temperature and to disturbing agents. Everything that enters the stomach, or that passes into the system through respiration or by abrasions of the skin, is urged forward into the blood, and thus sent on its way, for weal or woe, to every part of the system. If the fangs of a rattlesnake pierce through the skin at the extreme end of one of the toes, the blood is there ready to receive the poison and hurry it on towards the heart, which, as soon as reached, falters in its action, and finally stops beating. The sting of a wasp or hornet discharges into the blood a virus of much less potency, which is taken up in the same way and carried towards the heart. Slight constitutional effects, however, are experienced, and the poison expends itself in local inflammation, which soon subsides. Quick poisons are for the most part simply powerful sedatives; the action is to suspend heart pulsations, and the patient dies from syncope.

If we are brought into an atmosphere in which float the germs of small-pox, measles, scarlatina, diphtheria, etc., the germs pass into the air-cells of the lungs, and, penetrating the cell-walls, reach the blood. The heart receives them, but is not affected as by the virus of the rattlesnake; its direct action is not influenced, and the pulsations simply drive the septic matter into the general circulation. Here is the field for the exercise of its malign influence. One germinal particle, by a process of "budding" (a property peculiar to ferments), shortly becomes a thousand, then millions, of particles, and the normal condition of the blood is seriously disturbed. Great heat is engendered, the tissues are oxidized or burned with unusual rapidity, pustular eruptions form on the skin, which are but little surface volcanoes for the escape of the poison. The effort of nature to expel offending agents from the system is something wonderful. The struggle is entirely independent of the will, for the will is usually passive in severe diseases. If the system is capable of bearing up long enough under the disturbance, health is again established, but if not the body dies.

If we pour into the stomach substances foreign to its wants, substances which resist the normal functions of digestion, like alcoholic liquids and a hundred other vile compounds, the stomach expels them from its domain as speedily as possible; they are thrust out through the door which opens into the intestinal canal, and here the absorbents take them in hand, pass them over into the blood, and from thence they travel to all parts of the system. The stomach is the most abused organ inside of a human being, and fortunately has special powers conferred upon it of withstanding abuse. It has also the capability of taking terrible revenge for violence and injustice done to it. The man himself, or the woman herself, that is, the spirit, the intelligence, which temporarily resides in the physical structure, has no business to irritate and cripple the stomach, the most important apartment of all in the house in which he or she lives. We usually say, in speaking of the body, *my* body, or *our* bodies; but do we *own* these structures? Do we own them, as we do farms or merchandise? Do we obtain them by purchase? No. Here is a life principle, which, in order to become developed and fitted for a higher life, must have a material machine in which to exist and act. Nature provides a perfect machine, or one as nearly perfect as circumstances perhaps require, and this is *loaned* for the time being. It is only fair that we should take the best possible care of it; but if the motive of justice is ignored, then that of selfishness comes up with its claims. The purely selfish man finds it for his best interests to take good care of his body, and when it comes to special organs he guards well the stomach from abuse.

But a kind of delirium clouds the minds of millions; the weak, the irresolute, the viciously inclined, forget or ignore all self-obligations. They drench and drown their stomachs by pouring in gallons of vile ale, beer, rum, whiskey, adulterated wines, etc., but the dread nightmare of dyspepsia and delirium tremens takes terrible vengeance for this abuse. The glutton stands on no higher plane, and he must suffer as does the hard drinker.

There are illnesses which can be avoided, and those which cannot be. We cannot well escape the influence of contagia in all its forms. We live in a world which abounds in unseen perils, but it is the office of education to point out sources of danger, and inform us how best to escape them. If we place on the walls of our dwellings papers loaded with poisonous arsenical pigments, we ought to expect illnesses of the most serious nature, if we are readers and moderately intelligent. If we allow the waste of our dwellings to accumulate under floors, or under the windows, we ought to expect zymotic diseases to destroy ourselves or children, as science informs

us that from these unclean spots arise germs which are fatal in their influence. In this age there are many illnesses which ought no longer to trouble us, as science has pointed out their source, and how to avoid them.

THE CHEMISTRY OF STARCH.

A RECENT writer on agriculture remarks: "Although man can live upon food which does not contain starch, still it may be said that the daily want of every human being, from the time he can crawl until he goes into his grave, is so much starch: it constitutes the great bulk of the daily food of those who labor in all countries; and it is never absent from the diet of the wealthy, although their table may be covered with dainties furnished from every quarter of the globe." This is no exaggerated statement of the importance of starch as an article of human diet; and if this were its only claim to our consideration it might well deserve to be made the topic of a "familiar science" paper. We shall see, however, that it has other uses and applications of scarcely inferior prominence.

But what is starch? Chemically viewed, it is a compound of carbon, oxygen, and hydrogen, in the proportions represented by the formula $C_{12}H_{20}O_{10}$. This is precisely the same as that of *cellulose*, or woody fibre, the substance of which the *cells* of all vegetable tissues are made. We could hardly have a more striking example of dissimilar properties with similar composition. Common sugar and gum arabic are another familiar pair of these *isomeric* compounds, as the chemist terms them, both having the formula $C_{12}H_{22}O_{11}$. In such cases, we must suppose that, though the atoms making up the substance are the same, they are grouped or arranged in different ways, and thus give rise to distinct qualities in the substances.

Starch is exclusively a vegetable product, and consists of round or oval granules, varying in size in different plants from about $\frac{1}{250}$ to about $\frac{1}{3000}$ of an inch in diameter. In the potato, for instance, they are much larger than in wheat. They are made up of layers, formed successively about a nucleus or centre, and lines marking the layers can sometimes be seen on the large grains. As the grains from the same kind of plant are nearly uniform in size and shape, while they vary much in different species, the microscope will show to what plant starch-granules belong, and thus enable us to detect adulterations of arrowroot and other starchy substances.

Starch is insoluble in cold water, but if the water is heated to about 150° F. the grains swell and burst, forming a paste or jelly. If boiled for some time in water, starch is converted into the soluble gummy *dextrine*, another substance having the same chemical formula. The same transformation takes places in baking wheaten bread, the brownish glazing of the crust being composed of dextrine. It also occurs in the process of digestion, the starch being converted into dextrine, and this into sugar, which is yet more soluble and more readily absorbed into the blood-vessels. The saliva of the mouth and the gastric juice of the stomach have little to do with this process, which does not fairly begin until the food has reached the small intestine. The secretions of the pancreas and of the glands of the intestinal walls have the power of acting energetically upon starch. The layers of the granules are successively softened, detached, and broken up, and the transformation into dextrine and sugar follows. The farther on we trace the starch in the intestinal canal, the smaller do the granules become, in consequence of this gradual disintegration and solution.

It is hardly necessary to say that starch forms a large part of the food of all herbivorous animals, especially those that live upon grains, as well as of man.

It is also the first food of the young plant. It is for this purpose that it is stored up by the plant, and we plunder the depository in order to devour it ourselves. The seed, like the egg, contains an embryo, with a sufficient supply of food to "give it a start in life," or to nourish it until it can draw its nutriment from external sources. An admirable provision of nature this, from one point of view; but when we are told that the embryo plant cannot feed on starch, what shall we say of it? The hard-shelled insoluble granules are about as well adapted to the dietetic wants of the infant organism as a peck of walnuts would be for those of a new-born babe. Even the mature plant could do nothing with them, for it never becomes capable of swallowing its food in solid form. The mighty oak or the giant sequoia of the Yo Semite, like the most delicate of seedlings, must obtain all its nutriment in liquid or gaseous form. It derives the main part of its sustenance from "the chameleon's dish" of air, and the rest from the water that it drinks in by its leaves as well as its roots. Solid food must reach it, if at all, through one of these channels: but starch is neither volatile nor soluble in cold water; and starch, as we have seen, is the only food packed up with the embryo in the seed.

This arrangement, which seems at first glance so absurd, is, however, the best, both for the plant and for its plunderer, man. It enables the latter to store up the seeds until he needs them; and the former also has its food in a form which will "keep" until circumstances are favorable for its development and growth. Besides the starch, the seed contains more or less *gluten*, a compound which heat and moisture easily decompose, converting a part of it into the ferment known as *diastase*. This has the remarkable property of transforming starch into dextrine, and then into sugar, one part of it being sufficient to produce the metamorphosis in two thousand parts of starch. When the seed is placed in the moist, warm earth, it absorbs a little water, which starts this curious chemical process. The sugar formed is dissolved in the water, which the embryo plant sucks up, and turns the sugar into woody fibre. It is thus enabled to thrust a little root into the earth, and begins to draw its food from without. Next it shoots up a little stem, and spreads its first leaflets to the air and light. It now ceases to be dependent on the seed, and feeds no more on starch, though later in life it goes into the manufacture of the article, and stores it up in seeds, as the parent plant had done in its day and generation.

This conversion of starch into sugar is copied by man in the manufacture of glucose, of which we gave an account in the JOURNAL for November, 1880, and therefore need not dwell upon the subject here.

The brewer also takes advantage of the natural change in the seed by which diastase is formed. The grain commonly used for the purpose is barley, which is moistened and exposed to heat until it sprouts. When the gluten has begun to be transformed into diastase and the starch into sugar, the embryo plant is killed by means of greater heat. The *malt*, as it is now called, is next bruised and soaked in warm water, which dissolves out the sugar already formed, and also the diastase. The latter acts on the rest of the starch, converting it into sugar; and the sweet liquid is then boiled, hops are added, and afterwards yeast, to produce fermentation. The details of the process would be out of place here, even if we had space for them.

The use of starch for sizing and stiffening cotton and linen fabrics, though of much industrial and domestic interest, is not a chemical process, and therefore does not come within the scope of the present article.

EXPERIMENTS IN FLUORESCENCE.

IF we put some common paraffine oil, or a solution of sulphate of quinine, into a glass tube or other suitable vessel, and then look through it, the liquid will appear quite colorless; but if we allow the light to fall upon it, and then view it at a little distance and at a certain angle, some parts of the liquid will present a delicate sky-blue tinge. The effect in the case of quinine is heightened if the source of light is burning magnesium wire.

Substances which act upon light in this peculiar way are said to be *fluorescent*, and the phenomenon itself is called *fluorescence*, the name having been originally suggested by a variety of fluor spar which produces the effect. A writer in the last number of the London *Journal of Science* describes a variety of easy and attractive experiments illustrating fluorescence, from which we cull the following: —

If we cause a room to be darkened, and allow only blue light (by covering a hole in a window shutter with cobalt-blue glass) to fall upon a glass vessel filled with water which has been standing some minutes, on floating a strip of horse-chestnut bark upon its surface, in a few moments a stream of bluish-gray fluid (æsculine) will be seen slowly descending from the bark, — hanging, in fact, like a bunch of barnacles from an old ocean waif. Or if, under the same arrangement of light, or by using even more powerful absorbents of the ordinary rays (such as a solution of ammonio-sulphate of copper or one of chromate of potash), we look at a piece of what is commonly termed canary-glass, — that is, glass colored with an oxide of the metal uranium, — it will be seen to glow as it were with rich greenish-yellow rays, just as though it were itself a source of light; or if we take a solution of a uranium salt (the normal acetate), the phenomena are very striking when examined under the same conditions, and still more so by the electric light. But the salts of aniline — a substance which is the parent, so to speak, of mauve, magenta, and other brilliant colors — are singularly rich in exhibiting these effects.

A very beautiful experiment may be performed with the aniline red ink now so commonly in use. It affords, at one and the same time, an admirable illustration of Professor Tomlinson's submersion figures and of the phenomena under consideration. If we take a long cylindrical glass vessel, or one with

parallel sides, fill it with water which is allowed to settle, and then gently deliver a drop of the red fluid to the surface, the drop begins to contract, and slowly from its centre descends in the form of a tube; the denser parts of the coloring-matter presently form a thick circular rim at the end of the tube; but this is only for a moment, for a wavy edge appears upon this rim, then expands into a triangular parachute with a thickened edge, and from the extremity of each corner two or three smaller tubes descend; these in like manner pass through the same phases as the parent stem or tube.

HOW TO PRESERVE THE TEETH.

The following directions for the care of the teeth have been issued by the Medical Committee of the National Dental Hospital, London: —

(1.) The teeth should be cleaned at least once a day, the best time being night, — the last thing. For this purpose use a soft brush, on which take a little soap, and then some prepared chalk, brushing up and down and across. There is rarely any objection to the friction causing the gum to bleed slightly.

(2.) Avoid all rough usage of the teeth, such as cracking nuts, biting thread, etc., as by so doing even good, sound teeth may be injured.

(3.) When decay is first observed, advice should at once be sought. It is the stopping in a small hole that is of the greatest service, though not unfrequently a large filling preserves the tooth for years.

(4.) It is of the greatest importance that children from four years and upwards should have their teeth frequently examined by the dental surgeon, to see that the first set, particularly the back teeth, are not decaying too early; and to have the opportunity of timely treatment for the regulation and preservation of the second set.

(5.) Children should be taught to *rinse* the mouth night and morning, and to begin the use of the tooth-brush early (likewise the tooth-pick).

(6.) With regard to the food of children, to those who are old enough whole meal bread, porridge, and milk should be given. This is much more wholesome and substantial food than white bread.

(7.) If the foregoing instructions were carried out, comparatively few teeth would have to be extracted.

SCIENTIFIC BREVITIES.

Giants and Dwarfs. — The subject of anomalies in size of the human frame has been studied lately by Professor Tartuffi, of Milan. From careful measurements, he concludes that in giants it is the femur, or thigh-bone, which chiefly contributes to the elongation of their body. On the other hand, their vertebral column is short in relation to their enormous size. The humerus, or upper arm-bone, elongates considerably, but less than the femur. The foot and the hand grow proportionally to the stature. It may be generally asserted that the longer the bones are in the normal individual the more they are elongated in giants. The cranium of giants is commonly small in relation to their stature, but it is enormous in absolute measure, though their intelligence is generally small. An example was Broca's giant Joachim, who gained his living by exhibiting himself, and his friends said he had only sense enough for that. After death he fulfilled the same function, as he is now in the Broca Museum. Yet this great imbecile had a huge cranium, and his brain weighed nearly as much as that of Cuvier. Professor Tartuffi's observations on dwarfs are too scanty to be very conclusive; but it would seem that in them the femur, again, decreases most in relation to stature. The head of dwarfs does not generally diminish in proportion to the stature. As in giants, the upper limbs are less susceptible of variation than the lower, and the vertebral column and skull vary least with stature. Dwarfs are commonly lively, nervous, and sometimes turbulent. Some have been courageous and intelligent.

A New Test of Intelligence. — The Parisian scientist, Dr. Delaunay, has made the curious discovery that, to ascertain the qualities of a cook, it is sufficient to give her a plate to clean, or sauce to make, and watch how she moves her hand in either act. If she move it from left to right, or in the direction of the hands of a watch, you may trust her; if the other way, she is certain to be stupid and incapable. Similarly, the intelligence of people may be gauged by asking them to make a circle on paper with a pencil, and noting in which direction the hand is moved. The good students, in a mathematical class, draw circles from left to right. The inferiority of the softer sex (as well as of male dunces) is shown by their drawing from right to left; asylum patients and children do the same. In a word, *centrifugal* movements are a characteristic of intelligence and higher development; *centripetal* are a mark of incomplete evolution. A person, as his faculties are developed, may come to draw circles the opposite way to what he did in youth. Dr. Delaunay has some further extraordinary conclusions as to the relative positions of races in the scale of development from the way they wind their watches and make their screws.

The Language of Flowers. — Under this head the London *Garden* gives the following hit at the polysyllabic technicalities of botanical science, which are almost as bad as the names of some of the carbon compounds in chemistry: "Dr. Eriksson has recently described at Leipzig the protomeristem in the roots of dicotyledons. It appears that the root apex consists of three zones of meristem, the plerome, the periblem, and the dermocalyptrogen. In monocotyledons two additional types are met with, says the doctor: one in which there are four zones of meristem, calyptrogen, dermatogen, periblem, and plerome; the other type displays calyptrogen and plerome only, with a common zone for cortex and epidermis. We believe this doctor's cuticle must be too pachydermatous for castigation from a hebdomadary journal of phanerogamic and pomologic horticulture, so we think it better to let the further discoveries of this verbose doctor transmigrate to other situations."

A Curious Problem. — A querist in the *English Mechanic* lately raised the question how much farther a man's head travels than his feet in going round the word on a great circle, the man being six feet tall. Of course his head, or the top of it, goes through a circle twelve feet more in diameter than that traversed by his feet, and the difference in circumference is found to be about 37.7 feet. One mathematical idiot appears to have made out that the difference would be 4000 miles!

The Pigeons and the Whistle. — An exchange vouches for the following: A little colony of fan-tailed pigeons is kept at the works of the Union Manufacturing Company, at North Manchester, Conn. On Christmas day two young birds were presented to a family living three quarters of a mile from the mill. The birds were placed in a cage, and soon became domesticated, and apparently very much at home, so that a few mornings ago it was thought safe to place them in the house prepared for them, and let them loose. They remained quiet and contented until, at half past eleven, the whistle of the mill sounded. Instantly they flew into the air, and struck out in the direction of the sound. But before they were certain about their direction the whistle ceased, and the birds thereupon settled upon a neighboring roof and waited, evidently knowing that in half an hour they would hear the familiar sound again. The moment the twelve o'clock whistle began, they mounted straight into the air until they were able to locate the direction accurately, and soon after they alighted among their old comrades.

The Talmud on the Form of the Earth. — A writer in the *Jewish World* points out that, contrary to the received idea, the elder Rabbins of the Talmud taught that the world was round. This is shown by a passage in which, in discussing idolatry, the figures holding in the hand a *baton*, a bird, or a globe were prohibited, because the *baton* symbolizes the dominion of the world, the bird that the world lies beneath it, and the globe is forbidden because it resembles the form of the world itself.

A Novel Actinic Phenomenon. — A writer in *Les Mondes* describes a zinc white of dazzling purity obtained by precipitating a solution of zinc sulphate by means of barium sulphide, submitting the precipitate to strong pressure, and igniting it with limited access of air. If any barium sulphide escapes oxidation the white compound, on exposure to the sun, begins to darken, and in about twenty minutes becomes of a deep slate color. If removed into a dark place, it gradually loses color, and in about five or six hours it becomes again snow-white. This experiment may be repeated with the same specimen as often as desired. Further, this change of color does not take place under a slip of common glass, whether thick or thin; at most, the compound takes a slight yellowish-brown color on exposure to the sun for two hours. The sample, on analysis, was not found to contain silver or any other substance known as actinic.

Curious Experiment in Heat. — An apparatus, devised by Dr. Grassi, consists of three concentric vessels, separated by annular spaces of about two centimetres. The outer space is filled with oil, and the inner with water. The oil is heated by a gas furnace to above 100° C., when the water begins to boil. Oil heated to 150° is then introduced into the central vessel, and falls rapidly to a temperature close upon 100°. He finds that this central oil cools the more quickly the greater the heat of the outer ring of oil.

A New Public Chemical Laboratory in Paris. — An immense laboratory for chemical analysis is, by order of the Préfet de Police, about to be opened. Experts will there be at the service of the public for the purpose of analyzing wine, milk, chocolate, coffee, meat, — in a word, all articles of consumption, — and that for very small fees. This war against adulteration well deserves approval and encouragement.

ELECTRIC SPARKS.

Electricity and Moist Air. — Many of the books assert that moist air conducts electricity, though Silberman and others have proved the contrary. An interesting experiment bearing on this has been described lately by Professor Marangoni. Over a flame is heated some water in a glass jar, through the stopper of which passes a bent tube to a bell-jar held obliquely, which thus gets filled with aqueous vapor. The upper half of a thin Leyden jar charged is brought into the bell-jar, and held there four or five seconds; it is then found entirely discharged. That the real cause of this, however, is condensation of the vapor on the part of the glass that is not coated with tin-foil (the liquid layer acting by conduction) can be proved; for if that part of the jar be passed several times rapidly through the flame, so as to heat it to near 100° C., before inserting in the bell-jar, a different effect will be had; the Leyden jar will give out long sparks after withdrawal. This is because the glass, being heated, no longer condenses the vapor on its surface, and there is no superficial conduction, as in the previous case.

Troops Struck by Lightning. — A curious experience, perhaps unique in military annals, is re-

corded by a correspondent at the Cape of Good Hope in connection with the march of the Diamond-Field Horse to the scene of operations in Basutoland towards the end of last year. The men were preparing for breakfast, when a heavy thunderstorm suddenly burst over them, so severe in its effects that they were forced to abandon their attempt to procure a meal, and remounted in the hope of riding out of the storm. Towards three in the afternoon, however, it broke upon them with increased violence, the rain falling apparently in sheets, and the flashes of lightning appearing continuous. At last a flash struck the troops, flinging seventeen horses with their riders to the ground, and killing ten men and five horses on the spot. Those who were not killed were all seriously affected, and it was long before animation could be restored in the case of seven of the men. The bits and stirrup-irons of the whole number were blackened, and many of the men, though personally uninjured, had their clothing rent by the force of the electric discharge. The greatest difficulty was naturally experienced in preventing a general stampede among the frightened horses.

Practical Chemistry and the Arts.

FOSSIL IVORY.

That Egyptian mummies should have become merchandise in these latter days is not more strange than that "the whirligig of time" should have brought the fossil ivory of Northern Asia into commercial competition with the tusks of Indian and African elephants. It is stated by foreign journals that one result of the impetus which the success of Professor Nordenskjöld's expedition in the Vega has already given to trade with Northern Asia will undoubtedly be an increase in the supplies of fossil ivory which annually find their way into the English markets. A very large proportion of the ivory used in the industrial arts is the produce of the preglacial era, consisting of the tusks of mammoths which swarmed over what are now the steppes of Northern Asia, and bathed in the Yenisei, the Obi, and other great rivers of that continent, in whose banks they are now buried, or in whose waters they are frozen. A mild winter or a hot summer releases large numbers of the fossil bones and tusks of these animals, whose entire bodies are indeed sometimes exposed to view, after being kept in a state of perfect preservation for ages in the condition in which they were suddenly overwhelmed by the descent of glaciers from the north. The heavy floods caused by the melting of the snow and ice during the warmer months of the year wash down these relics of a former geological epoch, which are thereupon collected and brought to Europe to be made into the handles of knives and forks, and into various other articles for the use of the people of the nineteenth century. India, Ceylon, and Africa are consequently directly interested in the results of recent geographical research in a part of the world whose existing climate is the very reverse of their own; for an additional supply of mammoth ivory from Siberia means a reduction in the market value of the tusks of the smaller representatives of the extinct monster.

The ivory of India and Africa is, however, superior in whiteness and uniformity of texture to the fossil variety, and this fact will always insure a demand for it in the manufacture of certain classes of goods.

SUBMARINE CABLES.

The first cost of submarine cables is heavy, and they last, on the average, only ten or twelve years. If a cable breaks in deep water after it is ten years old, it cannot be lifted for repairs, as it is liable to break of its own weight. The action of the sea water gradually destroys the outer coating of iron wire, though the core of the cable may remain perfect. The companies are consequently compelled to put aside a large share of their earnings as a reserved fund for this decennial renewing of the cables.

The repairs of these submarine lines are also very costly. A ship has to be chartered at an expense of some five hundred dollars a day; and it generally takes several weeks to find the locality of the break and to mend it, which can be done only in favorable weather. A single break has sometimes cost a hundred thousand dollars.

Still, this branch of telegraphy is profitable, and new lines are continually being laid. There are six wires connecting this country with Great Britain and France, and it is announced that two more will soon be added.

INDUSTRIAL MEMORANDA.

A New Alarm Clock. — *Dingler's Journal* describes a clock which, at a given hour, lights a small lamp. The lamp is above the clock. Near it is a disc, with a sectoral piece cut out, and with a horizontal axis. This has a spiral spring, and, by means of a handle, is turned round to a tense position, in which it is held by a projecting nose and catch. When the nose is released at the proper time, the disc springs back and ignites a match over the lamp. The arrangement is said to work with great certainty.

Vinegar Making in Greece. — Dr. Xavier Landerer, in a communication to the London *Chemist and Druggist* says: It is noteworthy that every year in Greece hundreds of thousands of gallons of wine turn partly sour, and are thrown away because there are no vinegar works to convert it into good vinegar. The people try to set up the acetous fermentation by quenching red-hot tiles in the wine, or by setting it in the sun, but they are generally unsuccessful, so it remains neither drinkable wine nor good vinegar. The erection of vinegar works with proper apparatus would be of the highest importance for Greece and the Levant. Good vinegar imported from France is dearer than good wine. Countrymen bring vinegar from the villages, and hawk it through the streets, crying, "Buy chidi kalon!" — good strong vinegar; and to induce customers to buy the vinegar they demonstrate its strength. This Oriental process of acetometry consists in pouring some of the vinegar on the ground; and, pointing to the effervescence of the calcareous soil, the peddlers say that it is so strong that it dissolves the stones.

Paris Omnibus Horses. — These horses, most of which have been doing a little work on farms since they were two years of age enter the company's service just as they are coming five, and the first thing to be done is to accustom them to the noise of the streets and to trot under a heavy load. The novice is therefore driven at first with an old horse, which serves as a "school-master," and the horses purchased are, as a rule, so good tempered that there is no difficulty in harnessing them. The precaution most necessary to be taken is to prevent them, out of the exuberance of their spirits, from doing more than their fair share of work; for, unless the driver is very careful, a new horse will try to draw the omnibus himself, and will in consequence be exhausted at the end of the first journey. The ordinary day's work of an omnibus horse is four journeys over the line to which he belongs (this line varying from two to five miles in length); but for the first month no horse is allowed to do more than two journeys every other day. At the end of the first month he does four journeys every other day; but it is not until he has been in the service of the company for five or six months that he is set to do the full work. This progressive system of training is attended with the best results, and the average length of service is six years, the company having in their stables at the present time one animal which was bought in 1860, and which has been at work ever since. The omnibuses, which carry twenty-eight passengers, weigh, when full, nearly four tons, and the average distance covered in an hour is five miles, inclusive of stoppages. The company has over eleven thousand horses in all.

Improved Coffins. — The *English Mechanic* states that the firm of Rössler, in Chemnitz, have been for some time past trying to produce coffins which should be quite air and water tight, and should not lose this property after remaining many years in the ground. A coffin they made of stone-composition answered this purpose, but was too heavy, and would require a change in the method of burial. They have lately, however, surmounted this difficulty also by combining a thin coffin of wood with a thin one of stone-composition. The composition is formed of three parts Portland cement and one part finely-washed quartz sand. For the sake of adhesion, the inner surface of the wooden coffin (which encases the other) is left rough, as the wood comes from the saw. The top of the stone coffin is arched, in order to give it greater resistance to outer pressure, and the wood is shaped to correspond. The thickness of the wood is only 2 to 3 centimeters; that of the composition 1.2 to 1.5 centimeters. The weight of such a compound coffin is not greater than that of the common oak coffins. The closure is perfectly tight, so that the bodies of persons who have died of infectious disease may be safely kept in them in the house till burial. When the wood has decayed away in the ground, the stone coffin remains, uncompressed. The price of these coffins is said to be comparatively low.

RAILWAY NOTES.

Gas for Starting Locomotive Fires. — In Germany the practice of starting locomotive fires with gas instead of wood is being adopted on some of the railways, and is found to be economical. The apparatus used consists of a horizontal tube, and several vertical tubes with burners. Each vertical tube has a nozzle, in which the gas mixes with air drawn in laterally, before issuing at the copper burner. The lighting of the anthracite coal on the grate is done in 10 to 20 minutes, according to the gas pressure. In a gap between the bars is inserted from below an iron plate, the length of the system of burners, and so that it projects somewhat above the grate-surface. Then three or four shovelfuls of dry coal-pieces about the size of one's fist are placed about the plate, and the rest of the grate-surface is covered with a thin layer of coal. Then the plate is drawn out, and the system of burners put into its place; 300 quarts of gas lights the coal sufficiently. In the course of 30 to 45 minutes, according as the locomotive was previously warm or cold, the burning coal is pushed apart, so that the fire may extend as quickly as possible over the whole grate. The gas is conveyed to the burner-apparatus through a rubber tube from a small gas-holder, and the pressure can be easily varied at will. A recent improvement in the apparatus consists in doing away with the nozzle of each burner, and producing the mixture of gas and air by means of a single nozzle in the connecting pipe.

A Railway Regiment. — In Germany there now exists what is called a "railway regiment."

Since 1876 it has consisted of two battalions of four companies each. Formed exteriorly on the model of the corps of pioneers, it is recruited chiefly among the different handicrafts connected with railways. In case of war, each of the eight companies divides into several companies of construction and one working company, of 200 men each. The instruction for these two branches is given in summer, both in the way of practical exercises in construction and repair and in practical working of a railway line, called the military railway. The most frequent exercise is the construction of tunnels, considering the common event of tunnels being blocked in time of war. The organization referred to is another instance of that remarkable foresight to which Germany owes her military success.

An Effective Practical Joke. — In a recent experimental test of the Westinghouse air-brake on a Brazilian railroad, some practical joker, without the knowledge of the engineer, had placed on the track, in advance of the train, an excellent imitation of a huge mass of rock, made of painted pasteboard. The obstruction was not discovered until the engine was close upon it; but the engineer succeeded, nevertheless, in stopping his train within a few feet of it. The joke was rather trying to his nerves, but afforded the best possible demonstration of the value of the brake.

TESTS AND RECIPES.

Simple Test for Olive Oil. — One of the rarest articles of daily use is *pure* olive oil, and many think themselves fortunate to obtain oil which is in part made from the olives. Add to this fact the difficulty of distinguishing one vegetable oil from another by chemical tests, especially of recognizing them when mixed, and no wonder the importers of olive oil soon accumulate a competency. The test is exceedingly simple, and can be performed by any one possessing a good chemical thermometer. About a teaspoonful of oil is put in a test-tube, and a thermometer suspended in the oil, which is now to be heated to 250° C. (472° F.). For a comparison, a second test-tube of pure oil may be treated in like manner. Pure olive oil, when heated, grows rather lighter in color, but most other oils, like cotton-seed oil, peanut oil, etc., grow darker. The latter, also, evolve a penetrating and disagreeable odor, but olive oil has a pleasant smell, not unlike strawberries. This test, devised by Merz, is at least worthy of a trial.

Testing Drain Pipes. — A writer in the *Ironmonger*, from long practical experience in testing drain pipes, confidently recommends for that purpose what he terms a "smoke test," which gives evidence as to leaks both to the sight and smell. The materials that he employs are soiled cotton-waste and sulphur, the smoke from which, after ignition, is blown into the drain or pipes. If leakages exist in the latter inside of the house, the smoke and smell both issue forth and show that something is wrong, and generally tell also just where the fault or faults are. Sulphur, as well known, is one of the best of disinfectants, and a dose of the fumes from this to the drains, after disease has been in a house, would effect much good. On the whole, the method seems an excellent one for the purpose.

Citric Acid for Destroying Microscopic Life in Water. — Dr. Langfeldt has tried a number of substances for the purpose of destroying microscopic life in drinking-water. The most striking he obtained from citric acid. Upon the addition of one part to two thousand, life ceased in from one half to two minutes. Microscopic examination showed that those forms of animalculæ supplied with a thick epithelial covering are not affected by this dilute citric acid, but only those with delicate coatings. But as the greater portion of these unwelcome visitors belong to the latter category, and as those of the former variety are visible to the naked eye, a solution of the above-mentioned strength will suffice as a safeguard. In about one minute after their death, these animalculæ settle to the bottom of the vessel containing the water, and can always be found in abundance in the sediment. As the solution of citric acid spoils so readily, Langfeldt advises that it be freshly prepared every day.

Fluid for Writing on Glass. — Mr. F. L. Slocum, in the *American Journal of Phamacy*, says: "A preparation for writing on glass has lately come upon the market under the comprehensive name of 'Diamond Ink.' It is to be used with a common pen and at once etches a rough surface on the parts of glass it comes in contact with." It proves to be a very useful article for labelling bottles which are to contain liquids that will destroy common labels. It is made by mixing barium sulphate 3 parts, ammonium fluoride 1 part, and sulphuric acid a quantity sufficient for decomposing the ammonium fluoride and making the mixture of a semifluid consistency. It is claimed by the manufacturer that the mixture contains no hydrofluoric acid and does not corrode a pen; but of course, it does corrode a pen and hydrofluoric acid is the one thing that does the etching. Any one making this mixture and wishing to keep it in glass may coat the bottle inside with paraffine, beeswax, or rubber. It should be prepared in a leaden dish, and is preferably kept in a gutta percha or leaden bottle.

To Prevent Corrosion in Steel Pens. — According to the *Moniteur des Produits Chimiques*, this can be done by placing them for half an hour in a solution of sulphate of copper, and then letting them dry slowly. Of course the process simply gives the steel a thin coating of copper, which is not likely to be affected by any of the inks in ordinary use.

Agriculture.

FAILURE OF BEET-ROOT SUGAR EXPERIMENTS.

It must be admitted that the experiments made in New England to raise beets and manufacture sugar from them have proved thus far disastrous failures. It is deeply to be regretted that such are the results of great enterprise and pecuniary risks on the part of farmers and capitalists in different sections of New England. The Portland sugar factory was the first established, and the first to succumb; the machinery has been taken out of the building, and it will be devoted to other purposes. The mill established in Franklin County, Mass., owned largely by farmers, cost $131,000, and is as perfect in all its parts as any in Germany, from which country the machinery was procured. This mill has run one season, but it is doubtful if it will run the next, as the business is seen to be unsuccessful in a pecuniary point of view. The farmers have not been able to obtain pay for the beets delivered at the factory, but it is expected that ultimately all will receive their money. The number of beets worked up was 3321 gross tons of 2240 pounds. These cost the company, delivered at the factory, $20,300, or about $6.11 per ton. The product was 235 tons sugar and 180 hogsheads of syrup, a portion of which had been sold for $21,000, and the balance on hand was believed to be worth $15,000 to $16,000, making the income from $36,000 to $37,000, or between $10 and $11 for each ton of beets worked. It should not have cost over three dollars per ton to work the beets up into sugar, which would have left a margin of between one and two dollars profit for the company; but, owing to delays which were unavoidable, the beets had to be pitted, at a cost of about a dollar per ton, or over $3000.

The cost of work, and indeed everything connected with the mill, has been much larger than was anticipated. The company was greatly disappointed in receiving less than one third the amount of beets expected, and this has been attributed to drought, imperfect condition of the land, and general inexperience in growing the crop. The 3321 tons were only sufficient to keep the works active thirty days, thus showing that its capacity is over 100 tons per day. The exhibit, as presented by the Franklin Company, would seem to show that, with plenty of stock, received at the right time, the mill could be run at a profit. It is also shown that the experiment, so far as the mill goes, is a fair one; no more perfect machinery can be put in motion at present.

What are the causes of the failure of this industry? It has been conclusively proved that our soils are adapted to produce beets containing a fair percentage of sugar; it is proved that the yield per acre in many instances is as great as is grown in France or Germany; it is proved that we can manufacture sugar and syrup as good as has been produced in any country in the world. Where, then, is the difficulty which at present seems to hedge up the way to success in this important industry? It is manifestly in our failure to raise the beets cheaply and in large quantities, and to pursue the business as a permanent department of labor.

Any one who has observed the course of this industry in Europe knows that our methods of husbandry are entirely unlike transatlantic methods. In France and Germany women and children of both sexes do most of the labor in the raising of beets and all other agricultural products. They work in the fields incessantly, from very early in the morning until late in the evening. Wages are very low, and it is only by many hours of labor that a meagre livelihood can be secured. The beets for the factories are raised, in most instances, in close proximity to the mill, and the pulp is consumed on the farms. The cheap labor brings the cost of the beets at about one half what they cost under our system.

The notion that we can pay men $1.00 or $1.25 per day of ten or twelve hours to cultivate sugar beets is fallacious; and so is the idea that farmers living remote from a factory can cultivate a little patch of sugar beets, at a profit, in connection with the general crops of a farm. If the beet-sugar industry is ever successful in this country, it must be based upon a system, and that must be in accordance with business principles, such as govern our iron, cotton, and leather industries. The cultivation of the beet must stand by itself; it must be the one great product, disassociated from all other agricultural products. The factory must be as near to the beet fields as possible, and the pulp must be returned to the farms to maintain fertility. Such labor must be employed as is cheapest and most efficient. With these improvements beet sugar may yet become an important industry.

DR. LAWES ON FERTILITY.

Dr. J. B. Lawes, the eminent English agriculturist, is at present contributing a series of papers on "Fertility" to the London *Agricultural Gazette*. The following extracts from the first two numbers cannot fail to be of interest to our readers as a lucid presentation of the main points in the science of the subject: —

If we took a quantity of rocks, such as we find in various parts of the earth's surface, — granite, slate, quartz, limestone, etc., — and, after grinding them to different degrees of fineness, were to mix them together in different proportions, we could, from the known composition of these various rocks, produce soils which would contain the most important mineral ingredients of plant food in very different proportions. Assuming that we purposely made one soil as rich as we could in this food, one as poor as we could, with two others in intermediate stages, and we then left them exposed to the ordinary influence of sun and rain, — I am here assuming the experiment to be tried upon several acres, and the artificial soil to be several feet deep, — we should find that the seeds of plants carried by the winds and other agencies would spread and grow upon these soils with very different degrees of rapidity; and, assuming that we were able to watch the process for thousands of years, we might see several remarkable changes in the character of the vegetation. The surplus of the winter store of acorns laid up by a mouse might give rise to a forest of oaks, thick enough to destroy all the previous vegetation of grass; and, again, an accidental fire or a hurricane might sweep away the forest vegetation, to be replaced by growth of some other kind.

The character and amount of the vegetation would differ greatly on the different soils, and the largest amount would be found on the soil where the plant could get the largest amount of food.

There being no carbon or combined nitrogen in the soil, the first plants would be entirely dependent upon what they could obtain of these substances, directly or indirectly, from the atmosphere. Rain water always contains ammonia, and the plant and the soil may condense a certain further amount from the atmosphere; but growth even in the soil richest in mineral food would at first be small, as the decomposition of carbonic acid and fixation of carbon would be limited by the amount of combined nitrogen which the plant could obtain from the sources mentioned above; and it would be much greater where the most abundant mineral food existed, as every particle of nitrogen would be there used up; while where there was less mineral food, some of the nitrogen might pass through the soil and be lost.

Each year a certain portion of the vegetable growth dies off: leaves and branches fall, and portions of the roots decay; the greater part of the organic portion which falls upon the surface of the ground returns again to the atmosphere, but a certain part remains, and added to that which decays under ground becomes available for future growth. The atmosphere of the soil, which at first differed little from that which exists above it, becomes highly charged with carbonic acid, which decomposes the minerals in the soil; and thus, year by year, more and more of the nitrogen, collected by each generation of plants, becomes available for the generation that succeeds it.

This organic matter, under the general term humus, was considered by the chemists in the early part of the present century to be the main source of fertility. The late Baron Liebig turned this idea into ridicule, and the word has almost been forgotten.

Under the term humus I include all those organic compounds which have gone through certain stages of decay since they formed parts of living vegetation. These compounds may be distinguished from living vegetation by their containing a larger proportion of nitrogen to the carbon.

Upon the greater number of ordinary soils the proportion of both carbon and nitrogen becomes less and less as we penetrate below the surface; consequently these substances must have had their origin in vegetation which had once grown upon the surface. Some soils which are called alluvial possess a subsoil fertility, which appears to have been a deposit derived from the remains of vegetation washed from other soils. Fertility is therefore due to the organic residue of previous generations of plants, mixed with certain mineral substances, the most important of which are phosphoric acid and potash.

As the annual rainfall in most parts of the world is in considerable excess of the evaporation, it is evident that those substances which I propose to designate as the stock of fertility in a soil must exist in a comparatively insoluble form.

In regard to potash and phosphate of lime, we may assume that they are dissolved by secretions from the plant when the roots are in direct contact with them. Humus may be taken up in a similar manner, and by some plants more readily than by others. Still, it is not until the nitrogen of the humus has assumed the form of nitric acid that its full effect upon vegetation is realized.

A short time ago Schlosing proved that nitrification was due to the action of a minute organism which abounds in our soils. Under favorable conditions of temperature and moisture, nitric acid is produced with great rapidity; it has been proved in regard to the yeast plant (which converts sugar into alcohol and carbonic acid) that, like our ordinary crops, its growth depends upon a supply of mineral food. We know the nitrifying plant cannot carry on its work unless it is furnished with alkaline substances to neutralize the nitric acid formed. If, as may be the case, it requires alkalies and phosphates, we can explain why it is that the water passing through peaty soils does not contain nitric acid.

Under whatever conditions the nitric acid may have been produced, there is no doubt, however, that its efficacy as an agent of vegetable growth is very great; in fact, a farmer is often willing to give the value of a bushel of wheat for five or six pounds of nitrogen in this form. Every one must have noticed how difficult it is to keep land free from weeds; even our roads and gravel walks, if left undisturbed, soon become covered with vegetation. As a further illustration I may mention that upon the platform of the station which I frequent a number of minute holes exist in the asphalt, owing to the escape of small bubbles of air when it was in a plastic state; and in each of these minute holes a small plant has taken up its residence.

When the pressure of the atmosphere was first discovered, but before the cause was known, the philosophers of the day pronounced that it was due to Nature's abhorrence of a vacuum; a few years ago no more rational explanation could have been given for the persistent efforts of Nature to cover the earth with vegetation, but modern science has thrown more light on the subject. Boussingault placed some garden soil, rich in organic nitrogen, but containing very little nitric acid, in a closed glass vessel; it was moistened and exposed to a temperature favorable to nitrification, and was frequently stirred; at the end of a few months this artificial fallow had lost one half of its carbon, and a formation of nitric acid had taken place, which, if calculated on an area of an acre, would have been equivalent to several hundred pounds. In an ordinary winter most of this nitric acid would be entirely washed out of the soil. We learn from this that vegetation prevents the escape of nitric acid, and stores it up as food products; then, finally, when vegetation decays, it assumes the form of insoluble compounds, such as humus.

Independent, therefore, of the removal of food products from the soil, which is the main object of cultivation, the constant stirring of the soil brings into activity more of the inactive ingredients, while the cultivation of annual plants—by leaving the soil so long without vegetation — is followed by large losses by drainage.

SOWING SMALL SEEDS.

Amateurs and others not thoroughly experienced in gardening find a good deal of difficulty in raising plants from seed, especially in the case of very small seeds. The London *Garden* gives the following practical hints on the sowing and management of such seeds: —

Take calceolarias, for instance, or begonias, the seeds of which are as fine as dust, and sow either in the ordinary way, and the chances are that the whole will be lost; whereas by preparing the soil properly, and sowing on its surface, both kinds of seeds germinate freely. First drain the pan or pot, and then put over the crocks some moss or rough siftings from the potting bench, and on these some of the finer soil, finishing off on the top with very fine sifted soil mixed with a little silver sand. All should then be pressed down and made level and smooth, and then watered through a fine-rosed pot, or damped by means of a syringe, when, after standing to drain for a time, all will be ready for sowing. This can be the most readily done by opening one end of the packet and gently shaking it sideways, keeping it, when doing so, nearly on a level, in order that the seed may leave the paper slowly and evenly, as then there is no difficulty in causing it to be distributed regularly over the surface. This part of the work over, the next thing is to provide against the seed suffering from want of water, or the soil getting dry. For this purpose nothing answers so well as a piece of glass laid over the pot or pan, as it keeps the air in a thoroughly humid condition. A bell or hand glass answers the same purpose, if kept close, and in sunny weather it is always advisable to shade, as solar heat and light soon draw out the moisture. Should the soil become the least dry, the safest way to damp it is to bedew it with water from a syringe, as it can be done more lightly than with a watering-pot, if the syringe is used with dexterity. Seeds of a larger size than those named may be slightly covered, or have a very thin sprinkling of fine silver sand scattered amongst them, but only just enough to give color, and not bury the soil. Seed the size of mustard may be buried the eighth of an inch deep, and so on in proportion; but the great point with all to secure free germination is to have an equably warm, moist bed, from which they come forth without any loss.

GLEANINGS.

Japanese Dwarfing and Deforming of Plants. — Gardeners in Japar are expert in methods of producing artificial atrophy of plants, hindering their growth, making them deformed, and giving a strange fantastic appearance, which, indeed, is characteristic of much Japanese and Chinese art. M. Carrière has lately paid some attention to this art, which he calls *nanisation*, or dwarfing. In one form of it the plant is simply dwarfed, while its natural aspect is retained; in another, some kind of deformation is superadded. M. Carrière supposes that the gardeners proceed by choosing suitable varieties, twisting and binding their branches till they take a certain form, giving them scant nourishment, etc. These odd-looking plants are sometimes over a century old, and yet stand in small pots, the stem, it may be, quite filling the pot, or dividing into a number of greatly twisted parts. The climate of

Japan seems peculiarly suitable for the treatment referred to, which might hardly succeed in countries hotter or sunnier. Of all plants, the coniferæ, especially pines, seem to be those on which the Japanese operate most by the dwarfing method.

PARAFFINE TO PROTECT SEEDS FROM BIRDS. — A correspondent of an English paper gives his experience with paraffined seeds as follows: "Here we have great numbers of small birds of various kinds, always on the lookout for seeds when sown. In order to prevent their taking those of the cabbage tribe, radishes, etc., I first put the seed into a tin can, then drop paraffine on it in proportion to the quantity of seed, say a teaspoonful to four ounces. I then shake up the seed well, so as to get every one well coated with it; then a pinch of red lead. The tin is again well shaken, and every seed will be found to be red; but I do not think it is essential to use red lead. I have found anything in the form of powder to answer equally well, such as dry, fine wood ashes or soot. I find that the seeds germinate freely, and that they are safe from birds until this has taken place, but no longer. Some means must then be used to prevent them from pulling the young plants out of the ground. My practice is to keep them dusted with wood ashes or soot, mixed with any dust which may come to hand, till they are developed sufficiently to be out of danger. The birds do not seem to relish dirty seed leaves, and the ashes act as a stimulant to the young plants when washed in by rain or otherwise."

BIG TREES. — A grove in California, consisting of 1680 trees, contains not one which measures less than six feet in diameter. A rare and magnificent white oak is to be seen in the Quaker burying-ground in Salem, N. Y. It is more than 200 years old, and is remarkable for its enormous branches, which have a spread of 112 feet. A remarkable chestnut-tree is growing on a farm in Berks, Pa. It is nearly forty feet in circumference at the base, and the top of the tree can be reached by steps fastened between the limbs. Most remarkable of trees with a history is a russet apple-tree in Skowhegan, Me., which was planted in 1762. In its branches a play-room for children has been built for half a century. The tree is seven feet from the ground to the branches, five in number, all of which are very large and average thirty feet in length, covering a space of ground sixty-three feet in diameter. It is more than four and a half feet in diameter, and has yielded an average of thirty bushels of apples each year. A sprout from this apple-tree stands thirty-two feet from the parent stem, but is forty-eight years younger.

GRAFTING AND BEARING. — The editor of the *Prairie Farmer* says that he has grafted thousands of trees with scions cut from bearing trees, and other housands with grafts cut from young nursery trees, and that when planted in orchards there was no difference in bearing, or in any other way. This is in accordance with strict theory, for the character of a variety is not to be changed by growing a few years longer on one tree than on another.

A MAINE TREE. — Recently a white-pine tree was cut on the "Milford Timber Tract," which for size, length, soundness, and symmetry of proportion has challenged the eager lumbermen to produce an equal in the local forests of Maine. The circumference of the tree at the butt is 14 feet (diameter 48 inches); at the top, as far as used, 33 inches; the length, between the above dimensions, 103 feet, scaling 3559 feet. The tree was divided into six logs, the largest of which scaled 1003 feet. Thus perished a monumental reminder of the palmy days when lumbering was profitable in Maine.

PORTUGAL consumed nearly as much American wheat in 1880 as Germany.

Boston Journal of Chemistry.

JAS. R. NICHOLS, M. D., *Editor.*
WM. J. ROLFE, A. M., *Associate Editor.*

BOSTON, APRIL 1, 1881.

OUR ASYLUMS FOR THE INSANE.

AT no period has a more decided public interest been awakened in regard to asylums and our management of the insane than at the present. Some occurrences in our asylums have come to light which excite not only alarm, but a sense of overwhelming disgust and shame. That a physician, a superintendent, at the head of the largest asylum in Massachusetts, having absolute control over hundreds of the helpless insane, should be found guilty of the most shameless and criminal conduct is a startling fact. This lecherous individual has not received that public notice which his crimes demand. Perhaps it is better, however, not to let in the light upon his wicked deeds, so that the public may see them; but the *law* should hold him in its grasp, and punish him with extreme rigor. If such a man can find his way to a post so responsible as the head of an asylum costing millions of dollars, and sheltering under its roof hundreds of poor, defenceless invalids, what may not be done under cover of our public institutions? The state is lavish in its expenditures to provide shelter for the sick from external evils, but it fails to protect its wards from greater evils *within*. Is it not time to devise some plan by which clear, positive knowledge may be had of what is transpiring within the walls of our asylums? Our system is regarded by many as a failure, a sham, a dangerous device, and should no longer continue when better methods are distinctly in view. The vast piles of brick and mortar, perched upon the very apex of some of the coldest hills in New England, which cover under one roof from five to ten hundred human beings, all assumed to be mental imbeciles, are structures not erected in accordance with the best business or advanced medical wisdom. If, upon some occasion, when the occupants are away in the open air, a smart earthquake would topple them over, the state and the invalids would perhaps be the gainers thereby.

What is well known in Europe as the "cottage system," or the retention of the insane in smaller buildings grouped together, on farms, in pleasant localities, is the most sensible and effective method of providing asylums. There should be no appearances, within or without, calculated to awaken ideas of prison life, or of unnecessary restraint. The weakened, deluded mind can resume its normal state only under influences which simulate home and the quiet confidences of the family circle. Employment is an important factor in curative means, and one sadly overlooked in our stately palaces for the insane. But above and beyond all, in matters of prime importance, is the character and fitness of the *man* (and the men and women under him) having charge of the insane in our asylums. It is sad, indeed, to have one's confidence so decidedly shaken in regard to these important custodians of the sick as it has been by recent events; but we must not conclude that all are wicked and incompetent. We have many able, humane, discreet men in charge of asylums; but a knowledge of this fact should not in the least prevent a most constant and careful supervision. As in the state the price of liberty is "eternal vigilance," so in public institutions designed for the care of the sick, their safety and welfare depend upon a supervision which is ceaseless and thorough.

CANNEL COAL.

THE evidence of the unbounded resources of our country is constantly accumulating. Everything that an advanced civilization demands and which nature can supply is found here in great abundance. The prospective wealth and individual comfort which future centuries are to witness no one can fully conceive of, provided the miserable politicians can be smothered by the votes of the people, and their selfish schemes frustrated. The future of this country will be glorious indeed, if there is virtue enough in the people to preserve our institutions and maintain peace within our borders. We have, besides our cereals, immense deposits of iron, copper, zinc, manganese, silver, gold, quicksilver, antimony, — nearly or quite all the useful metals; also salt, oil, limestone, plaster, marble, phosphates; and lastly, as a crowning blessing, inexhaustible *deposits of coal* of every kind.

We are led to these remarks from the circumstance that a specimen of the most perfect *cannel* coal has been placed in our hands for analysis, brought from Kentucky. This variety of coal has been hitherto imported from England at great expense, and it was not known that we had deposits in this country. Quite recently beds have been discovered in Kentucky, which are represented to be of vast extent. The quality is excellent, fully equal to the best English, and the coal is so accessible, that it can be set down in Boston at about ten dollars a ton. The results of the analysis are as follows: —

Volatile hydrocarbon	65.40
Fixed carbon	24.96
Ash	9.64
	100.00

The coal is cleanly, without smut; the cleavage is sharp, and the fracture lustrous. Its specific gravity corresponds with the best specimens of English cannel. This coal, for gas-making and for parlor grates, will indeed be a boon of no small magnitude.

VENTILATING A ROOM WITH A PITCHER OF WATER.

SEVERAL years ago we commented upon a statement, then going the rounds of the papers, that the impure gases in a close room would be removed by an open pitcher of water. The pseudo-scientific nonsense has lately been revived, and is once more on its newspaper tour. It appears in one of the religious weeklies in the following shape: —

When windows and doors are closed, and several persons are sitting in one room, the air soon becomes close and impure, from the gases that fill an apartment from the breath of those in it. Set a pitcher of water, uncovered, in the room, and in a few hours it will absorb all the noxious gases in the room; the air will become purer, but the water will be filthy and poisonous, and should be thrown out, and fresh water put in its place. The colder the water the more gas will it absorb. This answers a young lady's question, "Why have you somewhere

stated that it is injurious to health to drink the water kept in a bedroom during the night, if the pitcher is left uncovered?" It should be closely shut, or left standing outside, covered from dust, on the window-seat, which is much the best way. Impure air is not so deadly as impure water.

One would suppose that it might occur to the writer of the above, as to any one having a smattering of scientific knowledge, that even if the small quantity of water in the pitcher were capable of absorbing "all the noxious gases in the room" it would be necessary for these gases to *come in contact* with the water; and this is manifestly impossible, unless currents of air from every portion of the room are constantly passing into and out of the pitcher. To assume the existence of such a system of atmospheric circulation as started and kept up by the attraction of the water for the "noxious gases" is perhaps more palpably absurd than the supposition that a quart or two of water can take up so great a volume of gas. That the water absorbs some impurities from the air, and that for this and other obvious reasons it is not so desirable for drinking as fresh water, "goes without saying;" but we warn our friends not to depend upon a pitcher or even a tub of water as a means of ventilating a close sleeping-room.

HOT ICE.

THE paradoxes of science are sometimes as wonderful as the tricks of the old magicians. That a liquid may be frozen in a red-hot vessel appears almost miraculous, and that ice may be made so hot as to burn the hand or scorch paper is a kindred marvel. Dr. Thomas Carnelly, of Sheffield, in a paper recently read before the Royal Society, described the experiments by which he has obtained this hot ice. Andrews had already shown that a gas cannot be changed into a liquid by compression, however great, if the temperature during the experiment be maintained above a certain point, which differs for each gas, and is known as the point of actual temperature. In the same way, it seems that a solid cannot be melted into a liquid by a considerable application of heat, if the pressure of the vapor evolved be kept below a certain amount. Dr. Carnelly has illustrated this in the cases of ice and corrosive sublimate, and similar results could doubtless be obtained with other solids. Our readers will be interested in the following account of his experiments with ice, which we take from our London contemporary, *Design and Work*:—

A large bottle, holding about a pint and a quarter, is fitted with a cap, and through this is passed a wide glass tube. The flask and tube are filled with mercury, certain precautions being taken to obtain sound joints and exclude air, and they are then inverted over mercury contained in a trough. The mercury runs out of the flask and upper part of the tube, and the lower part of the tube remains filled with a column of mercury equal in height to the barometer. The whole system, therefore, is equivalent to a barometer tube with a large bulb in the upper vacuous part. Inside the glass flask and tube thus exhausted a thermometer is previously arranged, and after the vacuum is established a small quantity of water, previously boiled to deprive it of air, is passed up the tube. The flask is now surrounded by a mixture of ice and salt. These materials, when mixed, produce an intense degree of cold, and cause the flask to act as a powerful condenser of any vapor that may be caused to rise from the water from the vacuous portion of the tube above the mercury. If the condensation be sufficiently good, the vapor is absorbed as quickly as it can be formed, even when the water is heated by a Bunsen burner, and the water passes into the solid state and cannot be liquefied, even although the tube in contact with it is made sufficiently hot to burn the hand.

In these experiments the thermometer has repeatedly been observed to rise to a higher temperature than that of boiling water when imbedded in the ice, the tension of vapor inside the apparatus being always below 4.6 millimetres of mercury. But as it was suggested that possibly the temperature as registered by the thermometer was not the same as the temperature of the ice itself, although it is difficult to conceive how this could be, Dr. Carnelly has taken the precaution to drop some of the hot ice into cold water, and has found the temperature of the water to be thereby raised instead of being lowered considerably, as would be the case with ordinary ice. This experiment, which we understand was undertaken at the suggestion of Professor Roscoe, conclusively proves not only that the ice is hot, but that it is hotter than boiling water, for in the experiments detailed by Dr. Carnelly it must have existed at 122° C.

METEOROLOGY FOR FEBRUARY, 1881.

THE sum of my observations the past month has been as follows: —

Average Thermometer.		Lowest.	Highest.	Range.
At 7 A. M.	20.39°	-4°	46°	50°
At 2 P. M.	31.64°	6°	54°	48°
At 9 P. M.	24.61°	8°	46°	43°
Whole month	2 .54°	-4°	54°	58°
Last 18 Februaries	24.42°	13.98° in 1868	31.38° in 1877	17 40°
Last winter months	22.82°	-7°	54°	61°
Last 17 winters	24..0°	16.17° in 1867-68	31.68° in 1879-80	15.51°

The average barometer for the month was 30.040 inches; the lowest 29.24 on the morning of the 13th, and the highest 30.58 on the morning of the 7th, a range of 1.34 inches. The sum of the daily variations was 7.63 inches, giving an average daily movement of .272 of an inch. The largest daily movements were .69 on the 19th, .65 on the 14th, and .60 on the 12th. Indeed, there was a remarkable agitation of the barometer for ten days, from the 12th to the 21st inclusive, during which the average daily movement was .437 of an inch, and nearly all the stormy weather of the month.

The face of the sky in 84 observations gave 49 fair, 8 cloudy, 20 overcast, 4 rainy, and 3 snowy. The amount of rain and 6½ inches of melted snow was 3.40 inches, falling largely on the 12th. The average amount for the past thirteen Februaries has been 4.31 inches; the lowest amount .55 in 1877, and the highest 6.96 in 1878, a range of 6.41 inches. The first lightning and thunder of the season was on the last evening of the month, with a fall of .15 of an inch of rain.

The direction of the wind gave an excess of 14 northerly and 60 westerly observations over the southerly and easterly, indicating the approximate average to be west 13° 30′ north, or a full point north of west, W. by N.

In general, it may be said that the month was a full degree warmer than the average for the past 18 years yet, with the snow remaining from January furnished good sleighing through the month, except 4 or 5 days after the heavy rain on the 12th.

It will be noticed that the entire winter months have been nearly one and a half degrees colder than the average, and I may add that February 2d was the coldest day of the season, the thermometer ranging through that day —4°, 6°, and— 3°, equal to an average of one third of a degree below zero. The snowfall through the winter has been 46½ inches, with much good weather to keep it, so that we have had in this region 72 days of good sleighing out of the 90. On the whole, the past winter was a very cold one, but quite healthy, and the ground generally so well covered with snow as to protect vegetation more than usual. D. W.

NATICK, *March* 3, 1881.

METEOROLOGICAL TABLES FOR SIXTEEN YEARS.

TABLE I.

YEARLY TEMPERATURE, RAIN, AND FACE OF THE SKY FOR SIXTEEN YEARS.

Temperature.			Yearly Face of the Sky.					
Years.	Temperature.	Inches of Rain.	Fair.	Cloudy.	Overcast.	Rainy.	Snowy.	Inches of Snow.
1864.	43.78°	-	-	-	-	-	-	-
+1865.	46.17	-	597	179	188	98	83	-
—1866.	45.25	-	631	155	181	94	84	-
—1867.	42.73	-	572	205	167	94	47	-
—1868.	41.85	-	5 0	161	143	109	55	-
+1869.	43.12	50.00	612	186	150	93	54	72
+1870.	46.10	—45.85	637	180	148	64	52	52
+1871.	46.82	+47.06	677	182	124	85	29	?
+1872.	48.9	+50.21	670	196	125	74	33	52
—1873.	46.48	—45.70	641	192	151	71	40	61
+1874.	47.18	—34.08	617	204	158	82	34	61
—1875.	45.15	+46.50	641	167	160	81	44	62
+1876.	47.75	+48.36	641	206	154	69	28	53
+1877.	49.54	—41.14	619	208	148	94	22	26
+1878.	49.57	+57.58	669	151	158	111	11	35
—1879.	47.72	—45.32	630	180	169	78	43	75
+1880.	49.23	—39.30	648	158	177	78	37	52
Average	46.20	45.88	630.12	182.0	159.0	86.25	37.25	55
Highest	49.57	57.58	677	208	188	111	55	75
Lowest	41.85	34.08	572	151	122	69	11	26
Range	7.72	23.50	105	57	66	42	44	49

TABLE II.

FACE OF THE SKY ANALYSED, GIVING THE AVERAGE RESULT OF SIXTEEN YEARS' OBSERVATIONS, TAKEN THREE TIMES EACH DAY, 1865-1880 INCLUSIVE.

	Fair Observations.			Cloudy.		
	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.
Average	198.56	218.62	212.94	64.8	71.4	45.9
Highest	215	243	235	84	87	58
Lowest	179	192	196	42	54	33
Range	36	51	39	42	33	20

TABLE II.— *Continued.*

	Overcast.			Rainy.			Snowy.		
	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.
Average	61.8	34.7	61.6	26.9	27.8	31.7	12.3	12.6	11.8
Highest	73	51	80	34	35	44	22	20	18
Lowest	46	17	48	19	20	22	4	4	3
Range	27	34	32	15	15	22	18	16	15

REMARKS ON THE ABOVE TABLES.

If, so to speak, the sun burned with uniform flame, radiating heat alike in every direction, it would seem that the earth, as a whole, must receive yearly equal degrees of temperature; but by consulting Table I. we perceive our mistake. The variations are numerous. The cause of these may exist in the sun, in the influence of ever-varying

spots and irruptions; or, the cause may be in local influences on the earth, different regions being visited by different winds, or with more stormy weather; or, all these and other causes may unite in producing these differing results. January, 1880, was remarkably warm, ten degrees above the average, while January, 1867, was as remarkably cold, being ten degrees below the average. So of different entire years, as 1868 compared with 1878. But while the heat is excessive in one region, as America, the reverse may be true in another, as in Europe or Asia, and thus the general average may approximate to equality.

Nature's pendulum is ever on the swing from one extreme to another, yet in the long run secures a golden mean. Seven seems to be a kind of sacred number in nature as in revelation. The week may be said to begin and end with a Sabbath, a rest, and a return. The foundation for this order seems laid in nature in the revolution of the moon about the earth, with a peculiar phase for each quarter or week, teaching the lesson to all attentive beholders. But this heptade extends beyond the body and spirit to the material world about us. For there are doubtless tides in the atmosphere as in the ocean, influenced by the moon, not only daily but weekly, furnishing the ebb and flood tides when the moon is in quadrature and syzygy. And must not such varying tides in the atmosphere, near eight hundred times lighter than water, naturally affect the weather, the air being the very medium of it, and that without which there could be no weather?

Hence the origin of a common idea that a rainy first Sabbath in the month will generally be followed by one or more rainy Sabbaths; and this is equally true of any other day in the week, and of fair weather as well as foul. But as the peculiar changes of the moon are a fraction over seven days apart, so this succession of weather is continually passing on to the following day. Other causes, however, are often interfering with this natural order. So both the temperature and weight of the atmosphere are never long stationary.

This heptade may perhaps be further applied to the temperature of a series of years, though liable to like interruptions. I have placed a plus or minus mark before each year in Table I., according as that year was of a higher or lower temperature than the preceding; and, beginning with 1866, we notice three years (and perhaps a fraction) of decreasing temperature, followed by four years (perhaps less that fraction) of increasing temperature, making seven years. The next three years, with one slight exception, indicate the return of nature's pendulum, followed by the next four years of increasing heat, with also a single exception. But this series of observations is too brief and limited for a full confirmation or refutation of the theory.

I will only further notice the unusually high average temperature of the last four or five years, an average of 48.76°, full two and a half degrees above the average of the past seventeen, in which no preceding year of that period had equalled even the lowest of these five.

In the column of yearly rainfall we notice the extremes in 1874 and 1878 as remarkable, showing a difference of 23½ inches, or more than one half the general average. It will be seen that the year 1878 was the climax, both in temperature and rainfall, which illustrates the principle that great heat produces great evaporation; but the next preceding year suggests a counter-cause, as the average heat was about the same, while the amount of rain fell short nearly 16½ inches. We should here remember that the ocean is the chief source of our rains, and not the immediate region where it falls. The plus and minus marks in the record of the rainfall in Table I. indicate a shorter swing of the pendulum, with like interruptions.

A careful analysis of the tables relative to the face of the sky will show the very general uniformity of these yearly aspects, and also the large proportion of fair weather as compared with the other four aspects, being in the ratio of 7 to 5, nearly, or 210 fair days to 155 foul. But time and space forbid further specifications. D. W.

EDITORIAL NOTES.

WHAT IS IT? — We have been requested to print the names of the two persons who were the first to send in answers to the chemical enigma in the February number of the JOURNAL; and we are very happy to do so, with their post-office addresses: —

C. W. FACEY, Cambridgeport, Mass.

F. W. KAAN, Dorchester, Mass.

As already stated, the two answers were received by the same mail, and both were therefore considered as entitled to the prize that had been promised, — a year's subscription to the JOURNAL.

BOTHERED BY "BOGUS." — Our "Americanisms" in language sometimes prove "conundrums" to European readers. A German correspondent writes as follows to the editor of the *London Medical Times and Gazette*: —

SIR, — In the number for October, 1880, page 561, of the very instructive *Medical Times and Gazette*, I read the name "Bogus" ("Dr. Buchanan and Bogus Diplomas"). I could not find this word (bogus) neither in the Sheridan-Walker (T. Knowles) nor in the German-English dictionary, and suppose, therefore, that "bogus" is a proper name. Am I right? You would oblige me by giving explication, and I should be happy to return service. I am, etc., F. BOCKELMANN, Dr., etc.

RUDOLSTADT, GERMANY, *February* 18th.

The editor replies thus: —

"The word 'bogus' is not even to be found in the work of our distinguished lexicographer, the great Dr. Johnson. It is an American novelty, and we believe means 'sham,' altogether untrue, and without foundation."

There is a touch of "unsuspected humor" in the statement that *bogus* is not even to be found in Johnson's Dictionary.

PERMANENT PICTURES ON THE RETINA. — The idea that the circumstances attending the sudden and violent death of an individual might be ascertained by an examination of the retina — amounting, perhaps, in criminal cases, to a revelation of the perpetrator's identity — was discussed soon after the discovery of the visual purple. Dr. W. C. Ayres, of New York, in an article upon the subject in the *New York Medical Journal* for March, shows the impracticability of detecting a murderer by means of an "optogramme," as a general thing. After describing the details of the process of obtaining an optogramme experimentally upon animals, he gives an amusing account of an attempt of his to make a picture of Professor Helmholtz upon the retina of an animal. The result was an image of Helmholtz's shirt-collar and the end of his nose.

COLD WEATHER AND HEALTH. — In his last report as registrar of Providence, Dr. Snow remarks: "There is a popular error, which we often hear spoken of in the winter season, that clear, cold weather is favorable to the public health. The truth is that *in this climate* severe cold weather, if continued more than two or three days, increases the number of deaths as certainly as continued hot weather, though in a different manner. Severe cold depresses the vital forces, and exposure to it produces fatal results among those persons, or classes of persons, whose vital force is weakened by any cause. Such persons are the aged and the very young, and also all who are sick or debilitated from any other cause. Besides this, severe cold is no preventive of, but on the contrary is favorable to, the spread of some of our most fatal diseases, as small-pox, diphtheria, and scarlatina. This is shown at the present time in Brooklyn, New York, Philadelphia, Chicago, and other places."

SALICYLIC ACID AS AN ADULTERANT. — The French Minister of Agriculture and Commerce has addressed a circular to all the préfets, stating that the Administration had had its attention drawn to the danger to public health which is caused by the employment of salicylic acid for the preservation of solid and liquid alimentary substances, and has submitted the question to the Consultation Committee for Public Hygiene. After a close examination of the matter, and submitting various substances to analysis, that body has reported that the acid is not only dangerous from the direct effects it may produce on the system, but is so also indirectly as favoring the fraudulent introduction of substances into alimentary articles, rendering these more or less injurious; and it recommends that the sale of any alimentary substance containing any salicylic acid whatever should be prohibited. The Minister accordingly inclosed to the préfets the formula for such prohibition, which he desires should be widely circulated and strictly acted upon.

LITERARY NOTES.

The Druggist's Handbook of Private Formulas, edited and published by Mr. John H. Nelson, Cleveland, Ohio ($3.00), has reached its *seventh* edition, which is ample evidence of its value to the pharmacist. It contains a great variety of reliable formulas for pharmaceutical preparations, perfumery, and miscellaneous articles sold by druggists, with much other matter useful to the trade. All the semi-official formulæ adopted by the American Pharmaceutical Association are included. Testimonials from competent judges go to show that it is practically superior to some books of the same character for which extravagant prices have been charged.

Mr. Presley Blakiston has just published *Drugs that Enslave*, a treatise on the opium, morphine, chloral, and hasheesh habits, by Dr. H. H. Kane, of New York city ($1.50). It is not a "sensational," but a calm and scientific, discussion of the subject. The statements concerning the rapidly increasing prevalence of these pernicious habits are abundantly sustained by trustworthy statistics. The practical part of the book, with its treatment of cases, will be of interest and service to the physician.

From the same publisher we have *John Hunter and his Pupils*, the elaboration of an address by Professor S. D. Gross before the American Academy of Surgery. It is an interesting account of the life of John Hunter, with notices of some of his most eminent pupils, the whole being comprised in a book of one hundred and six pages, and prefaced by an excellent engraving of Reynolds's famous portrait of Hunter.

Constipation Plainly Treated, by Dr. J. F. Edwards (also published by Mr Blakiston, at 75 cents), is a brief account of the functions of the stomach and bowels, with sensible hints for keeping them in order without the use of drugs.

The second number of "Morton's Pocket Series" of 25 cent manuals is Professor R. O. Cowling's *Aphorisms in Fracture*, a revised and enlarged form of a paper originally published in the *Louisville Medical News*, and received with much favor by eminent authorities in surgery.

The *Taming of the Shrew* and *All's Well that Ends Well* have just been added to Mr. Rolfe's series of Shakespeare's Plays. Mr. F. J. Furnivall, the eminent English critic, in a note to the *Salem Gazette*, endorsing that journal's praise of these books, says: "That, as school and family editions, they are superior to Hudson's school editions I have no shadow of doubt; they're more business-like, more thorough helps to a worker; and I have told Hudson's publishers so, while still maintaining my old strong praise of Hudson's character criticism, and of his book on the *Life, Art, and Characters of Shakespeare*. Each of these men, Rolfe and Hudson, is (in my opinion) better than the other in the special department of each; and school editions are Rolfe's specialty." The next play in the series will be *Coriolanus*, now printing. The *Comedy of Errors* will probably be published at the same time. All these books may be found at Williams & Co.'s.

The Art Amateur of New York, which is unquestionably the best of the journals devoted to the cultivation of art in the household, has been enlarged and improved with the beginning of the new volume for 1881. It is issued monthly at $4.00 a year, but by special arrangements with the publisher we can furnish it *with the* JOURNAL for that price.

Another important addition to our "Clubbing List" is *The Californian*, of San Francisco, the best and most popular monthly yet published on the Pacific Coast, and at present the only magazine west of the Mississippi Valley. The regular subscription is $4.00 a year, at which price we can furnish it *with the* JOURNAL.

Medicine and Pharmacy.

DROPS AND SPOONFULS.

In the JOURNAL for October, 1880 (page 119), we referred briefly to Mr. Talbot's experiments on the size of drops of different liquids, which show the danger of administering powerful medicines by that extremely variable measurement. In reply to some inquiries since received, we would say that Mr. Talbot's account of his investigations appeared in the *American Journal of Pharmacy* for July, 1880. It shows that the size of the drop varies not only with the nature of the liquid, but with different bottles filled with the same liquid; and the same bottle is inconstant in this respect. To drop from corks applied to the lips of bottles is even less accurate than using the bottles alone. "Droppers," or dropping tubes, are more trustworthy, but these do not always give uniform results. The following portions of Mr. Talbot's essay, with the appended table, will show the practical importance of his researches better than any further abstract can do: —

Strict general rules cannot be laid down as to the corresponding size of drops of classes of preparations, though the volatile oils, tinctures, spirits, oleo-resins, and fluid extracts may be grouped together, as yielding drops usually less than one half the size of drops of water. Solutions, syrups, and dilute acids afford drops but slightly smaller than water, excepting solution of nitrate of mercury and syrups containing or made from fluid extracts. Acids, wines, fixed oils, vinegars, and mixtures give, in most cases, drops of more than one half the size of water, — about two thirds.

In the drop measurement of the various classes of preparations in the United States Pharmacopœia there was found a noticeable uniformity; amongst the officinal wines the extremes showed a difference of but fourteen drops in the fluid drachm. The fluid extracts and tinctures, much larger classes, show, naturally, a greater range, but withal a regularity sufficient to suggest the addition of a list giving the average size of drops of each class. But four exceptions were found necessary; these are appended to the tabular list. The liquids yielding the smallest drop are placed first in order in the following table: —

AVERAGE SIZE OF DROPS OF CLASSES OF U. S. P. PREPARATIONS.

Class.	Average No. of drops in ƒ 31.
Ether and stronger alcohol	174
Fluid extracts	141
Spirits	141
Tinctures	136
Volatile oils	131
Oleo-resins	124
Acids (3 exceptions)	123
Wines	106
Fixed oils	103
Syrups containing fluid extracts	97
Mixtures	89
Vinegars	77
Syrups not containing fluid extracts	69
Solutions (1 exception)	66
Diluted acids	61
Exceptions.	
Solution nitrate of mercury	131
Nitro-muriatic acid	76
Muriatic acid	70
Sulphurous acid	59

In an article in the *Boston Medical and Surgical Journal* for February 10, 1881, Dr. E. J. Forster, of Charlestown, shows that the *spoonful* is as variable a measure as the drop, owing to the difference in the size of spoons and the difficulty of deciding when they are just full. He measured twenty teaspoons of different patterns, and found that when filled with as much water "as would ordinarily be taken up, so that the spoon would be full, but yet could be moved about without spilling its contents," the smallest held only 50 minims, while the largest held 125 minims; that is, a spoonful measured with the latter would be equal to two and a half spoonfuls measured by the former. The intermediate sizes gave 55, 60, 60, 75, 80, 85, 90, 95, and 110 minims. The same spoons filled *as full as possible* contained from 90 to 145 minims. Six dessert-spoons were found to hold from 2 drachms to 2 drachms 35 minims, or, when as full as possible, from 2 drachms 70 minims to 3 drachms. Fifteen tablespoons ranged from 2 drachms 35 minims up to 4 drachms 50 minims, or, by the other mode of measurement, from 4 drachms 30 minims to 6 drachms.

It will be seen that doses of powerful medicines administered by these spoons might in some cases be nearly *three times* as great as in others, — a range much greater than the prescriber would be willing to allow, and which in some cases might make a serious difference in the results. If a practitioner directs that a teaspoon or other spoon shall be used in administering his prescription, it will be well for him to test the capacity of the spoon if precision in the measurement is important. It would be better, of course, to use the graduated glass measures made for this purpose, and these ought to be a part of the sick-room equipment of every well-regulated household. A pair of them — a "minim glass" and one for drachms and ounces, measuring up to four or eight ounces — would cost only a trifle, and in the long run the saving in time and trouble compared with other means of measuring would more than balance their cost.

CARBOLIC ACID FOR COLDS AND COUGHS.

In the communication on this subject in the last number of the JOURNAL, the writer speaks of using "four parts of water to one of the acid." It has been suggested that this might be understood to mean one part of the *pure* acid dissolved in four parts of water, instead of one part of the *saturated solution* diluted with four parts of water. The latter is the meaning, as any physician or druggist would see at once. As it is well known that by "carbolic acid" a *solution* of the acid is usually meant, no druggist should sell the *pure* acid without knowing for what purpose it is to be used. So far as we have made inquiries, this is the rule with all druggists in this vicinity. Our Boston friend, whose notes on the use of the acid appeared in the JOURNAL for February, writes: "The pure acid should not be sold to consumers, and I make it a rule not to sell it. I let none go out unless it is prepared ready for use."

Correspondents who have used the acid as suggested in the JOURNAL for February have been much gratified with the results. To take a single instance, a professor in a Western college, writing March 8th, says: —

The article on the practical use of carbolic acid in the February number was of great interest to me. I was suffering with a very persistent sore throat and cough, and showed the article to my physician, who made use of carbolic acid spray in my own case and that of some others, with good results.

We have received sundry inquiries as to the "atomizer" necessary for producing the spray. Any of the forms of steam atomizer in the market may be used, or, if those are not at hand, the ordinary rubber-bulb atomizers will answer the purpose. One may, indeed, dispense with the instrument altogether, though it is *not* advisable to pour carbolic acid down the register, as one person, at least, is said to have done, in order to inhale the fumes! The writer of the notes published in February writes on this point as follows: —

I have used the steam of carbolic acid by heating the saturated solution in an open vessel over a gas or spirit lamp, and if one cannot get an atomizer this will do as well. It is a cheap way of using it, but it is troublesome to get it ready to use, and takes time also. When it is a question of convenience, the atomizer is always ready, and can be used a longer or shorter time, as may be necessary. A German professor has used the pure acid in inhalers, which must be continually worn. This would be troublesome, and air saturated with vapor does not, I think, have so good an effect as steam or spray. I am inclined to think that the use of steam or spray of *water alone* would soothe an irritated lung, or rather the irritated bronchial tubes; at least, when there is a dry, hacking cough. Water dissolves the acid readily, but holds it very feebly; so it is a good vehicle for conveying the substance to the irritated surface, and the readiness with which it gives it up insures prompt action. Inhaled, the acid acts as an anæsthetic and as a destroyer of microscopic organisms, and it is easy to comprehend how it benefits a cough.

THE HYGIENIC AND THERAPEUTIC RELATIONS OF HOUSE PLANTS.

In an article on this subject in the JOURNAL for June, 1880, we gave some account of the investigations of Dr. J. M. Anders, which appeared to show that house plants, so far from being injurious to health either in living-rooms or sleeping-rooms, were of service in supplying moisture to the furnace-heated air of our dwellings, and on that account positively useful in pulmonary diseases, since these are benefitted by a moderately moist and warm atmosphere. In the *Philadelphia Medical Times* of February 26, 1881, Dr. Ely McClellan describes the following case, which strikingly corroborates the views expressed by Dr. Anders: —

E. M. is a gentleman, thirty years old, who belongs to a family in which there is a marked history of phthisis pulmonalis. His physical appearance would indicate that he might be subject to the disease, but he has as yet escaped its development.

The history of this case involves the families of both the father and mother. The father, although born of tubercular parents, escaped the disease, but the mother died at comparatively an early age, leaving a family of five children, four of whom have died of consumption. Of these children, three died between twenty and twenty-five years of age; one died in his thirty-ninth year, after a long illness, the last two years of which were under my observation.

E. M. is the youngest of the family. His life, with the exception of the last eighteen months, has been devoted exclusively to sedentary pursuits. At twenty-three he married, and, as he was then engaged in an occupation which required his residence at an isolated locality, for both amusement and occupation his wife commenced the cultivation of house-plants. She soon became an enthusiast, and a profusion of plants, especially those of the foliage varieties, accumulated in her house. As they resided in an extremely changeable climate, where, during the cold months, constant watchfulness is

necessary for the preservation of plants, her bedroom and the adjoining sitting-room were arranged for that purpose.

Before his marriage, E. M. complained of, as he expressed it, "a weakness of the chest, and a constant liability to "take cold." Since his marriage, with the exception of an occasional dyspeptic ailment, he has seemed a healthy man; and it is but reasonable to attribute his escape from the disease which has destroyed so many of his family to the fact that he lives, and has lived for the past seven years, in apartments well stocked with thrifty plants.

COD-LIVER OIL IN PHTHISIS AND BRONCHITIS.

THE value of cod-liver oil in phthisis has more than once been set forth in the JOURNAL, and the various attempts to explain its superior therapeutical value, compared with other fats, have been considered. The most probable theory, as we have said, is that which ascribes its remedial action to the readiness with which it is digested and assimilated. We see that this view is taken by Dr. T. Lauder Brunton, in an article in the London *Lancet*, as the following extract will show: —

One of the most powerful expectorants is simply a little warm food in the stomach, and in cases of chronic bronchitis, in which the patients complain of violent coughing immediately after rising, one of the best expectorants is a glass of warm milk, either with or without a little rum, and a biscuit or a piece of bread, about a quarter of an hour before they get up. A little warm beef tea will have a similar effect. After taking this for a short time they generally tell you that the sputum comes away much more easily than before, and they are not so much exhausted by it. But perhaps the remedy, *par excellence*, not only in cases of phthisis, but in chronic bronchitis, is cod-liver oil. Persons suffering from long-standing chronic bronchitis will often come to a hospital to beg for cod-liver oil, saying that it eases their cough far more than any cough mixture. Other oils or fats have not this power to the same extent as cod-liver oil. We cannot say positively what the reason of this may be, but I think there is no doubt about the fact. My own belief is that cod-liver oil is more easily assimilated than other oils, and not only so, but more easily transformed into tissues themselves. Whether it owes this property to its admixture with biliary substances, or to its chemical composition, we cannot say. Dr. Weir Mitchell quotes a remark made by an old nurse, that "some fats are fast, and some fats are fleeting, but cod-liver oil fat is soon wasted." By this she meant that there were differences in the kinds of fat accumulated under the subcutaneous tissues of men, just as there are differences in subcutaneous fats which accumulate in horses. The horse fed on grass soon gets thin by hard work, while the fat laid on when the horse is feeding on hay and corn is much more permanent. Persons fattened on cod-liver oil soon lose the fatness again, and this, I think, points to the power of ready transformation which the oil possesses. Supposing that it does possess this power, we can readily see how very advantageous it will be. In chronic bronchitis, and in catarrh and pneumonia, we have a rapid cell-growth, but want of development. The cells lining the respiratory cavities are produced in great numbers, but they do not grow as they ought to do. They remain, more or less, lymphoid cells, instead of developing into proper epithelium. They so rapidly form, and are thrown off so quickly, that they have not time to get proper nutriment, and if they are to grow properly we must supply them, not with an ordinary kind of nutriment, but with one which is much more rapidly absorbed, and is capable of much more rapid transformation in the cell itself than the usual one. This power is, I believe, possessed by cod-liver oil, and to its quality of nourishing the rapidly-formed cells in the lungs in cases of bronchitis and catarrhal pneumonia I believe its great curative power is owing.

THERAPEUTICAL HINTS.

CARBOLIC ACID IN ERYSIPELAS. — Subcutaneous injections have already been employed, and not without success, about the borders of the parts involved in cases of erysipelas. In private practice this method cannot be followed, at least in erysipelas of the face. The following formula, which has been employed for some years by Dr. Rothe, of Altenburg, seems, if not to arrest the course of erysipelas, at least to abridge considerably its duration and to lessen its gravity. Dr. Rothe bathes the affected surfaces with the following liniment: —

℞ Acidi carbolici	gr. xv.
Alcoholis	♏ xv.
Ess. terebinth.	ʒss.
Tinct. iodini	♏ xv.
Glycerinæ	ʒiv. M.

These applications are quite neutral; they do not even cause heat of skin. From the next day it is pale. This plan does not, any more than previous methods of local treatment, prevent the extension of the disease elsewhere, but in bathing the affected surfaces a rapid retrocession is obtained, so that erysipelas of the face lasts only three or four days. The places bathed every two hours are covered with a thin layer of cotton, kept in place by a bandage. The various internal symptoms are to be combatted with the usual remedies.

SOMETHING NEW ABOUT DYSPEPSIA. — By means of the stomach-pump, M. See has satisfied himself that in some cases of dyspepsia the gastric juice is lacking in hydrochloric acid; in other cases the pepsine, or gastric ferment, fails in the power of converting nitrogenous food into peptone; in others the gastric juice is altered by mixture with a large quantity of mucus. Excess of peptones, too, after an excessive meal, may hinder the gastric juice from acting; while in a starving state, dyspepsia may arise from failure of protoplasm in the peptic glands. These various alterations of the gastric juice constitute true gastric dyspepsia. M. See has conformed his treatment to these data. Especially he has given attention to clearing out of the stomach, removal of liquids adverse to digestion, by means of the pump, and so helping to restore the healthy secretory or digestive functions. The operation is harmless, and may be very beneficial.

USE OF SOAP-SUDS IN BURNS. — Dr. Likernik recommends soap-suds made of any soap on hand to spread over burned surfaces. Their action in relieving pain and reducing inflammation is due to the presence of the alkali, and they possess, he thinks, evident advantages over powdering with bicarbonate of soda.

LOCAL APPLICATION IN DIPHTHERIA. — Dr. C. P. Clark, of Oswego, N. Y., speaks very highly of the value of the application to the fauces twice daily of the liquor ferri persulphatis, in cases of diphtheria. He says: "It is certainly worth all the other remedies I have ever tried, many times over."

MEDICAL MEMORANDA.

SHAVING REACTION IN ENGLAND. — According to the *Lancet*, the present tendency in England is towards shaving rather than the full-bearded fashion of late years. The following is an extract from an article on the subject: —

"We fear the laborious argument that it was healthful to man to spare himself the trouble of shaving was somewhat strained, and that the wish for a fashionably formidable appearance was father to the thought of healthfulness as regards the wearing of beards and mustachios. The number of persons returning to the old English practice of shaving both the chin and the upper lip is noticeably increasing, and there is certainly much to be said for the clean and orderly character of the result. It is at least a remarkable circumstance that throat affections have not died out, or, we believe, sensibly diminished, since the custom of growing the beard became general. It must, in the long run, be a matter of personal predilection whether a man shaves or leaves his face embellishment to nature. It is practically, in this case as in most others, idle to seek an argument in favor of the vagaries of fashion in the code of health laws."

A HOMŒOPATHIST ON "HIGH POTENCIES." — At a recent meeting of the Homœopathic Medical Society of New York, Dr. H. M. Paine is reported to have said: "Our experience in the use of high potencies is based, as Hahnemann's was, on theoretical grounds only. It is one of the most singular forms of idealism ever seriously entertained by the medical profession. I firmly believe that when our reputed cures are reported in connection with all the cases treated, we shall find that their frequency is not greater than those of daily occurrence without the intervention of medicine of any kind."

HOMŒOPATHIC ITEMS. — Dr. Love, President of the French Homœopathic Society, has received the Legion of Honor, a triumph for homœopathy which has created no little irritation in the opposite camp. Dr. Love is of British extraction, thus adding to the list of contemporary celebrities for whom France is indebted to England. — According to the Paris *National*, the journals of Lerida (Spain) announce that the curé of Seudomi has declared from the pulpit that any sick person belonging to his parish who tried to cure himself by homœopathy would, in case of death, be refused the rites of the church. — Over 6000 homœopathic physicians are registered in the United States. Of this number nearly 1000 practice in the State of New York; between 600 and 700 in all New England.

DISLOCATION OF THE LIVER. — Dr. A. Y. P. Garnett, in the *American Journal of Medical Sciences*, reports the only case of sudden dislocation of the liver, apparently, on record. A lady aged fifty, while stooping down hurriedly to pick something from the floor, "felt a sudden wrench or giving way on the right side." Examination revealed a displaced liver reaching to the crest of the ilium. Much discomfort was experienced, but the patient was relieved by spontaneous reduction, which occurred in the space of three days. A week's confinement to bed, followed by a broad elastic band around the waist, constituted the further treatment.

A CELLULOID NOSE. — A German medical journal states that a dentist in Bamberg recently modelled a celluloid nasal organ for a patient who had lost his nose in consequence of lupus. Rhinoplasty had been tried by Thiersch, but the absence of the nasal cartilages made the operation an unsuccessful one. The nasal passages were kept open by the introduction of goose-quills, and the patient was in a distressing condition. A plaster-of-Paris model of the parts was first made, and then a wax nose fitted to the same. This was afterward worked in celluloid, and two little silver canulæ substituted for the goose-quills. By a hooklet the celluloid nose was attached to a pair of spectacles. This apparatus is cleaned twice daily, and occasions so little inconvenience that the patient does not even remove it at night.

DEATH AND CASTOR OIL. — The *British Medical Journal* states that in an inquest on the body of a child who died after the administration of castor oil the coroner, in summing up the case, said that the public ought to know that there were several kinds

of castor oil, only one of which was fit for medicinal purposes for human beings, namely, "the cold-drawn oil." Castor oil could be, and often was, obtained from oil shops which was quite good enough for horses and cattle, but was full of impurities. To give little children common oil was simply to make them worse.

LONGEVITY OF WOMEN. — The recent European statistical returns of the population of Europe have supplied the statistical department at Vienna with the means of making an interesting study as regards longevity. It results from this that of 102,831 individuals who had exceeded the age of ninety years, 60,303 were women and 42,528 men. The greater longevity of women is exhibited also by the greater chances of women of attaining or exceeding the hundredth year. Thus, in Italy there are found 241 female centenarians for 141 male centenarians, and in Austria 229 women for 183 men. In Austria there are 1,508,359 sexagenarians, or 7.5 per cent. of the total population.

RUM-DRINKING IN THE BRITISH NAVY. — It is stated in London journals that the British Government, recognizing the almost universal desire to check the drinking of spirits, intend to stop the issue of the rum ration to officers in the Navy, with compensation to them. It is also intended to stop the rum ration to boys, giving in its place a ration of soluble chocolate, in the middle night-watch, which will likewise be given to the men, as an inducement to them to abandon their rum.

SELECT FORMULÆ.

QUILLAIA TOOTHWASH. — According to Mr. A. E. Bennett, in the *Journal of Pharmacy*, an excellent toothwash containing glycerine is made as follows:

Soap bark, ground	4 oz.
Glycerine	3 oz.
Diluted alcohol, sufficient for	2 pints.
Oil of gaultheria	20 drops.
Oil of peppermint	20 drops.

Macerate the soap bark in the mixture of glycerine and diluted alcohol for three or four days, and filter through a little magnesia previously triturated with the volatile oil. Thus made, a much better preparation is obtained than by macerating the bark in the dilute alcohol, and adding the glycerine afterward.

SOOTHING OINTMENT. — Dr. McCall Anderson, in the *Specialist*, gives the following formula as the most soothing and sedative ointment for inflamed surfaces that he has become acquainted with: —

	Parts.
Bismuthi oxidi	25.00
Acidi oleici	200.00
Ceræ albæ	75.00
Vaselini	225.00
Olei rosæ	0.25

CARAMEL. — The following process is given by a good authority: Dissolve 7 pounds crushed sugar in 1 pint of water, boil it in a five-gallon copper kettle, stirring occasionally until it gets brown; then reduce the fire, and let the sugar burn until the smoke "makes the eyes water." When a few drops let fall into a tumbler of cold water sink to the bottom and harden sufficiently to crack it is done. Then pour on it, by degrees, about two quarts of warm water, stirring all the time. When well mixed, filter it hot through a coarse flannel filter. (Some use lime-water to dissolve the burnt sugar.) Care must be taken not to overburn it, as a greater quantity is thereby rendered insoluble. The heat should not exceed 430° F. nor be under 400°. The process for nice experiments is best conducted in a bath of melted tin, to which a little bismuth has been added to reduce its melting point to about 435°; a little powdered resin or charcoal or a little oil being put on the surface of the metal to prevent oxidation.

PREPARATION FOR CORNS. — Jazow, in the *Vratch Vedomosti*, quoted by the *N. Y. Medical Record*, recommends painting the corns with the following preparation: Extr. cannab. indicæ, 5.0; acid. salicyl. 20.0; collodii, 240.0. In all cases where it was used, the corns rapidly disappeared.

EDISON'S POLYFORM. — A correspondent of the *Druggists' Circular* gives the following as the correct formula for Edison's polyform: —

Hydrate of chloral	1 oz.
Alcohol	4 oz.
Chloroform	2 oz.
Camphor	2 oz.
Oil of peppermint	2 minims.
Oil of cloves	2 minims.
Salicylic acid	72 grains.
Nitrite of amyl	72 grains.
Morphia	48 grains. M.

For external use.

The editor dryly remarks that the formula only needs a little of the celebrated *phosphate of pumpkin seeds* to make it perfect.

MISCELLANEA.

INEBRIATED PORKERS. — The *London Medical Times and Gazette* states that for the last twelvemonth two French *savants* have been keeping nine pigs in a state of habitual drunkenness. This has been done with the view to testing the effects of different kinds of alcohol on these animals. The Prefect of the Seine, last year, put some sties and a yard in the municipal slaughter-houses of La Villette at the disposal of the *savants*, in order that they might conduct their experiment at the smallest cost to themselves. We learn that the pig who takes absinthe is first gay, then excitable, irritable, combative, and finally drowsy; the pig who has brandy mixed with his food is cheerful all through till he falls to sleep; the rum-swilling pig becomes sad and somnolent almost at once; while the pig who takes gin conducts himself in eccentric ways, grunting, squealing, tilting his head against the sty-door, and rising on his hind legs, as if to sniff the wind. Dr. Decaisne, writing on these intoxicated swine in *La France*, remarks that they are none of them the worse for their year's tippling.

CLOSING THE LEFT EYE. — The following authentic passage is extracted from a circular of the Swiss Federal Military Department: "Infantry recruits who cannot close the left eye while keeping the right open should exercise themselves assiduously in order to obtain this result before the opening of their school. For this purpose they should place their left hand over the closed left eye, withdrawing it insensibly without closing the right eye. Recruits who, on entering the schools, are not able to come with the left eye closed must expect to be punished, unless it can be shown that this inconvenience is due to some organic defect."

QUITE ANÆSTHETICAL. — The following is from the Paris *Figaro:* A famous surgeon advises one of his patients to undergo an operation. "Is it very severe?" asks the patient. "Not for the patient," says the doctor; "we put him to sleep; but very hard on the operator." "How so?" "We suffer terribly from anxiety. Just think, it only succeeds once in a hundred times."

DUNDREARY AS A DOCTOR. — The late Mr. Sothern was designed by his family for a surgeon, but after witnessing an operation in one of the London hospitals he became disgusted with his intended profession, and decided to study theology, with a view to taking orders in the English church. A chance participation in some amateur theatricals, in which he took the part of Othello, led to his determination to exchange the pulpit for the stage.

PUZZLED. — An elderly lady, who was handling a set of false teeth in a dentist's office, asked, "Can a body eat with these things?" "My dear madam," replied the consultant, "mastication can be performed with a facility almost equal to nature itself." "Yes, I know all that," answered the old lady, "but can a body *eat* with them?"

Boston Journal of Chemistry.

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Boston Journal of Chemistry
AND
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Familiar Science

NEW INVENTIONS AND DISCOVERIES.

THE present age may properly be characterized as the golden age of inventors and discoverers. So fully convinced is the commercial world of the utility and value of scientific research, that the investigator or inventor has not long to wait for a golden harvest if he has anything to offer which is new and adapted to supply a want. The rapidity with which new devices are adopted in business and domestic life is wonderful. Five years ago not a single telephonic circuit existed in the world which could be used for practical or business purposes; now there are 165,000 instruments in use in the United States alone, and there are only six or eight cities of 10,000 inhabitants which are without a telephone exchange. Probably more than five millions of people in this country make daily use of the telephone for business or other purposes. Thousands are hourly holding conversations between distant points, over single wires, and by means and appliances wholly unknown to science at the close of General Grant's last term of office.

Up to the date above indicated (1876) not a single investigator in the department of electric lighting had carried his results beyond the stage of experiment. No actual practical business test had been made, no effective dynamo-machine had been constructed, or form of lamp devised. Now, one inventor has in practical use over 6000 lamps, distributed in part as follows: 800 lights in rolling mills; 1340 in cotton and other factories; 430 lights in stores, hotels, etc.; 300 lights in parks, docks, etc.; 300 in railroad dépôts; 200 lights in mines; 1500 in stations for city lighting. There are other devices, of perhaps equal utility, at work in all parts of the country, and the call for the appliances for this method of lighting is far beyond the ability of manufacturers to supply.

Twenty years ago the only available agent for the supply of explosive force was gunpowder. The army of miners and excavators, employed in digging for the precious metals or in cutting through mountains for railroad transit, felt the need of some more effective and powerful agents to tear the rock masses asunder; but it was not until some accidents on shipboard startled the world by the terrific nature of the explosions that it was known that chemists had discovered nitro-glycerine, an agent possessing a force ten times greater than gunpowder. This substance has now almost entirely displaced gunpowder in all great mining and engineering works the world over, and it would be difficult to dispense with it as an article of every-day use for many purposes.

Nickel is a metal long known to chemists and metallurgists; but it was regarded as exceedingly unpromising in its industrial applications, and treated with neglect. It is less than a score of years since one of its salts, the double sulphate, was prepared, and from its solution the bath which made possible the deposition of the metal by the electric battery. This despised metal is now of inestimable value, as it affords a surface more beautiful and enduring than silver on implements and utensils of the widest range.

The discovery by Bessemer of a cheap, quick method of making steel is quite recent, and yet we know that it has revolutionized track construction on railroads. No road with any considerable amount of traffic can afford to use iron rails; and, indeed, so important is this discovery that it would be impossible to pay dividends on most roads without an increase of traffic rates, if iron alone was used. Steel, by the Bessemer method can be made as cheap as iron, and the difference in price is now inconsiderable.

In agriculture the discovery of the mineral food of plants led to the discovery of the vast beds of phosphatic rocks in the ancient sea-basins of Charleston, S. C., and an industry was developed which is of great magnitude and importance. We could greatly extend the list of important discoveries and inventions which have been made within the memory of most persons of adult age, all of which have given fortunes to the parties interested in originating and developing them. The slow appreciation of new discoveries in a former age has passed away, and no longer do the many decades of years elapse before they are turned to practical account.

Henry discovered the electro-magnet in 1819, and it was not until 1844 that it was utilized in the construction of the telegraph. Faraday discovered electro-magnetic induction in 1831, but it was not until 1851 that a practical dynamo-machine was made of small dimensions. Since 1850 the world has progressed with giant strides in the practical application of the results of scientific discovery, and it is probable that no diminution of interest will be experienced in the course of the centuries which are to come.

A RAPID TELEGRAPH.

"As quick as a flash" is a familiar expression used to denote instantaneous action, and practically we may consider the action of electricity as instantaneous. It is claimed that on a single telegraphic wire between this city and New York over 500 pulsations per second are transmitted and received. The pulsations of light waves in the luminiferous ether can alone be compared with it.

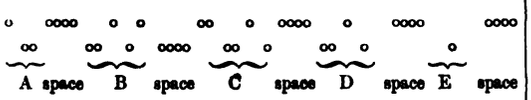
It is also claimed that a speed of 1000 words per minute has been attained on regular work, by the American Rapid Telegraph Company, whose office is in Devonshire Street, in this city. Upon calling at the office, Mr. Pettangill kindly explained the apparatus and its workings to us, and we will attempt to describe it for the benefit of our readers.

The method employed for transmitting messages is that known as the "rapid system." The messages are first prepared by the use of perforating machines, operated by a key-board, and made to puncture two lines of perforation in a narrow strip or ribbon of paper. Upon the perfection of these machines, which are the invention of Mr. Frank Anderson, of Peekskill, N. Y., the success of the system largely depends. Although of very complicated mechanism, any person can operate them at sight, and with a few week's practice can prepare messages for the transmitter with the same rapidity that messages are sent by the Morse system, and with far less liability to error.

This perforated ribbon is then used as a stencil in the transmitter, every puncture appearing as a dot or dash on the chemically prepared paper at the other end of the line. This method of automatic telegraphing is not new, but it was found that a limit to the speed of sending signals was soon reached, owing to the line becoming "clogged" or surcharged either with the battery current or an earth current. In other words, when a current of electricity is sent over a long wire for a very short space of time, say the one hundredth part of a second, it does not all leave the line at the other end within that space of time, and a discharge continues at the receiving end of the line after the battery circuit has been completely broken at the transmitting end, so that the next impulse sent over the line overtakes the first one. The result is a long or indistinguishable dash or line. To obviate this difficulty Messrs. Foote and Randall, in 1874, conceived the idea of employing a second current of opposite polarity to free the line and cut off each dot or dash quickly and sharply. In 1876, these gentlemen farther improved their process

so as to employ each current for sending signals, which are received and recorded in two parallel rows, each alternate dot or dash being in a different line; so that no confusion arises from the end of one signal coinciding in point of time with the beginning of the next.

The alphabet employed consists of dots and dashes, similar to the Morse alphabet, excepting the exclusion of the spaced letters. Each letter is separated from its neighbor by a long dash, and the words themselves by still longer dashes. A single perforation in the paper ribbon produces a dot, two perforations a dash; four perforations make the long dash employed to separate two letters. Thus the letter A consists of a dot and a dash; the paper receives one puncture on one edge and two on the other. B is a dash and three dots; the paper receives two perforations on one side, followed by three single holes on alternate edges.



The perforated strips, containing any number of messages, are drawn rapidly through the transmitting machine, by simply turning a handle. The transmitting instrument consists of a drum, made in two parts and insulated from each other, one being joined to the positive, the other to the negative, pole of two batteries. Pressing against these drums are two pens, made of a number of fine steel wires, and both connected with the line wire. The strip of paper passes between the pens and the drum, preventing contact, until a hole in the paper permits one or the other pen to drop through, and allows either a positive or negative current to flow from the battery into and through the line wire. As no two holes on opposite sides exactly correspond, both currents are not admitted simultaneously.

Messages are recorded at the receiving station on yellow paper ribbon, prepared by passing it through a solution of ferridcyanide of potassium, chloride, and nitrate of ammonia. This is decomposed by the current, forming clear blue characters, similar to those made by the old Morse recording instrument, excepting that they are alternately in two parallel lines. The messages are then placed in the hands of girls, who translate them into print by the use of type-writers more rapidly than could be done by hand, and the receiver of a message is relieved from the task of deciphering poor chirography.

The improved form of perforating machine now in use will prepare a message for transmitting as quickly as the Morse operator can send it; but the labor of thirty perforators can be sent without delay over a single wire, so that one wire will do the work of thirty wires used by other companies. The skill required to use a perforator and the knowledge necessary for translating the message when received being far less than that required for sending and receiving by the old method, the cost of labor is much reduced. Mr. Anderson is now engaged in perfecting a simpler form of perforator, to be placed in the office of bankers and merchants who wish to perforate their own messages, thus enabling them to make use of any sort of cipher or secret code. Such despatches, relieving the company from responsibility for errors, will be sent for a few cents per yard. The house to whom such messages are sent must of course employ a clerk capable of translating the signals used.

It need hardly be said that the wire which is to do the work of thirty ordinary wires must be of excellent quality. Copper is the best conductor of electricity, but steel is stronger; advantage is taken of both. A steel wire is covered with pure copper by electro-deposition. The joints in the wires are both soldered and covered by a suitable sheath.

The battery employed is Bunsen's combination of zinc and carbon: the former being placed in the porous cell, which contains only water and mercury; the latter in the outer jar, which contains a solution of potassium bichromate and sulphuric acid. Such a battery furnishes electricity of greater potentiality than that obtained by the sulphate-of-copper battery used by other telegraphic companies.

The immense amount of business that may be done on a single wire and the small cost for labor enable this company to place their rates much lower, especially for long messages, than the other companies, while in speed and accuracy it is far superior. The charge made for a message of 20 words between Boston and New York is 15 cents, and 40 words may be sent for 25 cents, the price charged for ten words by the other lines; 190 words may be sent for $1. To Baltimore and Washington 25 cents is charged for 20 words, or 95 words for $1.00.

THE CHEMISTRY OF LEATHER.

The manufacture of leather is a chemical process, although leather had been made before chemistry was acknowledged a science; and tribes of people who know but little about civilization are conversant with means for converting skins into leather, or at least of rendering them pliable and durable, this being the twofold object of tanning. It is but recently that our knowledge of the anatomy of the skin and the action of chemicals thereon has been sufficiently accurate to place the art of tanning among the chemical industries.

The skin of man and animals consists of two layers: the epidermis, or cuticle, without, and the derma, or true skin, beneath. The epidermis is hard and horny on the surface, especially on the hands and feet. It may, in fact, be divided into two layers: the outer, which is dead and without sensation or the power of reproduction, and the inner, where successive layers are being formed to take the place of those destroyed. It is, however, the true skin, or derma, which is employed for making leather. This also consists of two layers: the corium, or deep stratum, and the papillary, or superficial layer.

The first operation is, in most cases, the removal of the hair, unless, as in the case of furs, the skins are to be tanned with the hair on. Milk of lime, sulphuret of calcium, and mechanical means are employed to remove the hair and epidermis.

Afterwards, the skins are placed in a sour infusion of barley or rye meal. This sets up a kind of fermentation, which destroys the cellular tissue in which the hairs are rooted, so that both hair and epidermis are easily removed by scraping.

All portions of the skin, the cells of the epidermis as well as the fibres of the true skin, swell up in boiling water, and sooner or later are converted into glue. Alkalies and dilute acids react differently upon different constituents of the skin: thus lime-water removes certain albuminoid bodies without destroying the fibres themselves, while certain metallic salts and organic substances unite with the fibre to form very stable compounds, not unlike the union of certain dyes with vegetable fibre. Upon these peculiar reactions depends the success of different methods of tanning.

The process of converting the hide, stripped of all useless parts, epidermis, fatty tissue, etc., into leather may be considered under four heads, namely, tanning proper, tawing, oiling, and lime-curing.

In the common process of red tanning a vegetable substance is employed, to which is given the name of tannin, or tannic acid. This substance, when pure, has an astringent taste, precipitates solutions of gelatine, and yields with salts of iron a black or green precipitate, frequently used, suspended in dilute gum water, for writing-ink.

In tanning many different substances are employed, such as oak bark, sumach, divi-divi, catechu, etc. Oak bark contains from 10 to 15 per cent. of tannic acid. The bark is cut in small pieces, and is then known as tan bark, or simply "tan." Pine-tree bark is also a good material, containing about 7 per cent. of tannin. In this country it is less frequently employed than hemlock bark. Sumach grows wild in many parts of our country, and should find extensive use in tanning, but requires care in regard to the time and method of collecting it. It contains from 12 to 16 per cent. of a substance closely resembling the tannic acid in nut-galls, beside small quantities of gallic acid, and also a yellow dye-stuff.

When a hide has been thoroughly cleaned,—on the flesh side by soaking in water and scraping, on the hair side by sweating or liming,—the pelts are "raised," the lime compounds removed, and the fibres of the skin swollen up so that they can more readily absorb the tanning material. This raising or swelling is done by placing it in a sour bath of wheat or barley, where lactic fermentation is going on. The various acids, lactic, formic, acetic, butyric, etc., thus formed cause the pelt to swell to double its usual thickness. In two weeks' time this operation is completed, and the hide is ready for the action of tannic acid. This is usually effected in vats sunk into the earth, where tan bark and hides are arranged in alternate layers, and the whole saturated with water. The first time they are left in the vat eight or ten weeks; after taking them out and renewing the tan bark, they are put in again for three or four weeks; the third lasts still longer; and in case of a very heavy hide a fourth, and even a fifth, immersion is necessary, requiring nearly two years in all. For light and thin skins a cold-water extract of the tanning material is employed, and the whole operation is finished in two or three months.

Russia leather is made from the hide of two or three year old calves. The tanning material employed is willow bark, sometimes also pine and pear bark, used either in vats or in the form

of extract. The operation lasts five or six weeks. When this is completed the leather is well rubbed on the flesh side with birch oil and oil from sea calves, to which it owes its peculiar odor, and then it is passed through rollers, that impress upon it a peculiar figure and roughness.

Morocco, or Turkey leather, is a fine, soft, dyed leather, tanned with sumach. For genuine morocco the hide of goats is used, while split sheep and thin calf skin are converted into an inferior morocco for bookbinders' use. The dye is applied to one side only, either by a brush or by dipping. The best morocco is dyed before it is tanned. Recently aniline colors have been largely used for dyeing leather, both morocco and skivers (split sheepskin). Roan is sheepskin tanned like morocco, but wanting the grain given by grooved rollers.

Tawing, or alum tanning, is chiefly employed for light leather, kid, sheep and calf skins. After the skins have been cleansed and swelled, or raised, they are drawn once or twice through a bath of 75 parts alum, 30 of common salt, and 225 of water. They are piled up without wringing, for two or three days, then wrung out and slowly dried.

Glove kid is made from the skins of young goats or lambs. The grain is not removed, as with wash-leather or undressed kid. The prepared skins are placed in a paste made of wheat flour, yolk of eggs, alum, common salt, and water. This not only tans it, but the oil of the egg renders it pliable, and gives it the property of modeling itself to the hand. The kid is generally dyed on the grain side.

In each of the above methods of tanning, one chief object is to form with the gelatine of the skin an insoluble compound. In the preparation of wash-leather, or chamois, the object is to render the leather soft and pliable, but not water-proof. The hides, as soon as the lime has been removed by the sour bath, are frized by rubbing with pumice to remove the grain, and then covered with oil — usually cod oil — on the grain side, pressed and exposed to the air, oiled again; and the operation is repeated many times, until they acquire a peculiar odor, like squills. The excess of oil is removed by a sort of fermentation, the skins being piled up in heaps in a warm room, and carefully covered with a linen cloth. The operation is stopped when the uniform yellow color shows that the oil has been oxidized. The rest of the oil is removed by a warm potash solution.

THE MIGHT OF MITES.

A Mohammedan legend relates that when Abraham had been wronged by the mighty hunter, Nimrod, Jehovah befriended the patriarch, and told him to select an animal to punish his enemy. Abraham chose the fly; but Jehovah said, "If thou hadst not chosen the fly, I should have sent a creature, a thousand of which would not weigh as much as a fly's wing."

This is only a bit of Oriental rhetoric, a figurative way of emphasizing the power of the Almighty, who can make the smallest things the ministers of his wrath; but in the light of modern science it has become a literal truth. Some of man's most powerful and persistent enemies are organisms so minute that a thousand of them would not equal the bulk or weight of a fly. The lord of creation, as he proudly styles himself, is unable to cope with the most infinitesimal of his subjects. They refuse to acknowledge his sway, and wage perpetual warfare against him. His utmost skill and ingenuity are taxed in resisting and guarding against their attacks; and often, in spite of all his manœuvres, they out-general and defeat him. No hostile force of his own race could inflict such disaster upon him as do these microscopic representatives of the lowest forms of life. They plunder and devastate whole provinces, bringing ruin upon long-established and flourishing industries and poverty upon large and prosperous communities. Neither fire nor sword is so much to be dreaded, for the injury that they may do is transient and reparable, while these diminutive foes not unfrequently take permanent possession of the territory they have conquered, and no force that its rightful owners can call into the field suffices to dislodge them.

Insects are terrible foes to man in many cases, but he is gradually getting a mastery over them. Against the army worm, the grasshopper, the potato bug, and all their voracious kindred he is learning to fight successfully. The insects which are still most mischievous are generally the smallest. The phylloxera, or grape-louse, is almost microscopically minute, but the injury it has done to the French vineyards is already reckoned at hundreds of millions of dollars. It has been a greater terror in France than the German armies, and its invasion is likely to prove more disastrous. The Germans could be bought off, though at heavy cost, but the phylloxera is not to be got rid of so easily. It has its Sedan every season, and its army of occupation holds a broader territory than Alsace and Lorraine. It will probably be conquered in the end, but it will be the dearest victory the French have ever won.

But the phylloxera, though a thousand times smaller than a fly, is a mammoth in comparison with many of the creatures that are enemies to man. Just now the mere name of one of these animalculæ is menacing an important branch of our foreign commerce. The *trichinæ* is disturbing the business relations of two continents; and not only merchants, but legislators and statesmen as well, are excited on the subject. And what *is* this formidable *trichina*? A parasitic worm, about a hundredth of an inch in length, yet more terrible to man than the anaconda or boa-constrictor. Its very existence was unknown fifty years ago, and its real nature and habits were not understood till within twenty years or so. The reader does not need to be told that under certain circumstances it infests the flesh of the hog, and that the diseased pork, if eaten by man without being thoroughly cooked, may transfer the parasite to the human muscles, with dangerous and often fatal results. No wonder that our foreign friends are alarmed when they are told that American pork is liable to be of this trichinous character. The reports may be false or exaggerated, perhaps set afloat by interested parties who want to keep our pork out of their markets; but the trichina is none the less a frightful reality, and the risk of its presence in pork cannot be too vigilantly guarded against both at home and abroad, from commercial no less than hygienic considerations.

But space will not permit us to refer in detail to the numberless organisms, animal and vegetable, whose power for evil is as great as their size is insignificant. Here belong nearly all the forms of mildew, blight, rot, and the like, which are the cause of such wide-spread injury and destruction in the vegetable kingdom. The great majority of these pests are themselves low forms of vegetable life of a fungous nature. Their powers of growth and reproduction are marvellous, and their life is the disease or death of the higher species of plants which they infest. The fungus which causes the potato rot is a familiar example of this type of organisms, and everybody knows how, at its first serious onset, it brought famine upon a whole country, and how much loss to the farmer in other lands it has since occasioned.

Microscopic species of plant life are also the source of moulds, ferments, and many kinds of apparently spontaneous change and decay that infect, injure, or destroy animal and vegetable substances. Of course many such processes are of a chemical nature; but even these sometimes owe their inception to microscopic fungi. It is hardly necessary to add that many scientists and physiologists now believe the origin and spread of contagious diseases to be due to infinitesimal germs, and that measures for the destruction of these are consequently the most effective means of restricting the range of such diseases.

Thus in the domain of matter, as in that of morals, has God chosen the weak things of the world to confound the things that are mighty. Far smaller creatures than constituted some of the plagues of old Egypt become the ministers of his judgments, and man is made to tremble before living things which the utmost power of his microscopic lenses almost fails to discern.

ELECTRIC SPARKS.

Electricity for Lighting and Extinguishing Lamps. — A French journal describes two new and ingenious pieces of electrical apparatus for lighting and extinguishing lamps. In one of them (M. Margret's system) the oil-lamp stands on a base in which is a horizontal electro-magnet. From the armature of this rise two parallel curved rods of copper, joined at the top by a platinum spiral, which is rendered incandescent by a battery current, and brought in that state to the wick, when the armature is attracted. In this movement towards the wick, a small bellows is compressed, giving a puff of air through a tube rebounding on the wick. In the case of lighting the lamp, this puff has no effect, but when the lamp has been burning, and is to be extinguished, the puff produced by a momentary passage of the current blows the flame out, and there is not time for the spiral to relight the lamp. In the other system (that of M. Ranque), a platinum spiral is brought to the wick, much in the same way, but the lamp is put out by an extinguisher at the end of a curved and pivoted wire. The contrivance is such that the extinguisher is brought down to the wick, or raised from it (through attraction of the armature), according as the flame is to be put out or lighted.

A Powerful Electric Light. — The American Brush light appears to be one of the most successful of the various forms of electric light now being tested on a large scale abroad. The Brush company has lately made for the use of the British navy an apparatus which has been tested and found to have a 100,000-candle illuminating power, — a power fifty times greater than the ordinary electric lamp for street lighting. This is believed to be the

largest and most powerful light ever made with human hands. It is designed to be used in night attacks, and to scrutinize the sea for torpedoes. A 40 horse-power engine is required to produce the light. The carbons used are two inches and a half thick. The intense heat generated between the carbon points is half a million degrees, one ninetieth the estimated heat of the sun. It is calculated that with an ordinary reflector a beam of light will be cast so powerful that a person fifteen miles away can see to read by it.

An Electrical Elevator. — Dr. Siemens, who appears to be indefatigable in seeking to extend the sphere of usefulness of electricity, has brought out an electric elevator, which he has been exhibiting at Mannheim, Germany. Its construction appears to be simple, and suggests an easy method of putting in safety brakes. The cage is carried by wire ropes, having counter-weights, so that the cage, when loaded, is practically in equilibrium. The current generator at the base is electrically connected to the dynamo-machine in the cage, and the latter actuates two toothed wheels, taking into a metal rack running up the centre of the passage-way of the lift.

Electricity in Surgery. — Trouvé's utilization of electricity in combination with surgical instruments is bearing fruit. A case is recorded from Vienna in which a doctor has succeeded in curing a cancer in the stomach, mainly by the assistance rendered by the polyscope. The electric probe, which rings a bell when a ball or any metallic substance imbedded in the muscles is reached, is highly prized by army surgeons, and an application of the same principle to surgical forceps has enabled a Berlin oculist to save the eye of a workman, which was damaged by the intrusion of a spark of steel. This case had become so urgent that it was necessary to extract the piece of metal without delay, or to excise the eye; but Dr. Hirschberg, by inserting a soft iron probe, and subsequently converting it into an electro-magnet, withdrew the particle of metal, and saved the eye.

SANITARY NOTES.

Encouraging Sanitary Science. — The London Society of Arts has decided to award three silver medals for as many London houses as may be found, on examination, to be furnished with the best known sanitary appliances. The conditions include proper provisions against frost, infection, damp, and other cognate evils. The comment of an English contemporary on this is that if the judges have to visit the metropolitan houses until they discover three worthy of the prizes, the peripatetic labors of Diogenes will be trivial compared with their task.

Aluminous Disinfectants. — In a communication to the St. Petersburg Technical Society, Professor Beilstein recommends the use of sulphate of aluminium as the best practical disinfectant. He states that the best method of making the salt for disinfecting purposes is to mix red clay with 4 per cent. of sulphuric acid, and to add to the mixture some carbolic acid for destroying the smell of the matter to be disinfected. According to this authority, lime and its salts only temporarily destroy bacteria, and under some circumstances contribute to their development; and sulphate of iron, even in a solution of 15 per cent., does not ultimately destroy bacteria, as they revive when placed in a suitable medium.

Carbolic Acid as a Disinfectant. — In a paper recently read before the Sheffield Literary and Philosophical Society, by the President, Mr. A. H. Allen, he said that, in comparing the relative antiseptic value of various disinfectants, he was disposed to give the first place to carbolic acid and its preparations, at least for disinfection on a large scale. Certain other disinfectants, which had been very extensively advertised, and the sale of which was pushed in every possible manner, appeared to have very little real value.

Microscopic Examination of Water. — In searching for infusoria and animalculæ in water, it is evident that unless they are present in very large numbers, the chances of finding one in a drop of water small enough to be examined by the microscope are small. It is the old problem of "a needle in the haystack." Certes puts a little osmic acid in the water, which kills the organism, and on letting it stand for several days their remains will collect at the bottom, so that the examination of a few drops will generally result in finding them, if present.

Practical Chemistry and the Arts.

WHAT IS RESORCINE?

Our foreign contemporaries are beginning to discuss the use of resorcine as an antiseptic and disinfectant, and our readers will naturally inquire what it is, how it is made, and what are its properties. It belongs to a class of bodies called *phenols*, to which carbolic acid also belongs. In chemical composition they resemble alcohols, in that they contain what is called the hydroxyl group, OH. They are divided into monatomic phenols, which contain but one of these groups, diatomic, which contain two, and triatomic, which contain three. Carbolic acid belongs to the first of these; it is a monatomic phenol, C_6H_5 (OH). Resorcine is a diatomic phenol, CH_4 $(OH)_2$, and has the same composition as two other phenols, hydroquinone and pyrocatechine, with which it is said to be *isomeric*, of equal measure. Pyrogallic acid is a triatomic phenol, C_6H_3 $(OH)_3$.

Resorcine was originally obtained by fusing certain resins, as gum ammoniacum or galbanum, with caustic potash, extracting it from the fused mass by acidifying with sulphuric acid and shaking with ether, and then purified by distillation. Since it has come into more extensive use for the manufacture of dyes, new and improved methods have been devised for its manufacture. The method now in use consists in fusing disulphobenzolic acid with caustic alkali. The process consists of the following stages: chemically pure benzol (from coal tar) is allowed to flow slowly into four times its weight of fuming sulphuric acid of 80°. This mixture is gradually heated to the boiling point of benzol, and heated for two or three hours with a return cooler. It is subsequently heated for a short time to 275° C., then poured into water and neutralized with milk of lime. The lime salt is subsequently converted into a soda salt, which is heated for nine hours in a cast-iron vessel with caustic soda. The soda is subsequently removed by means of hydrochloric acid, and the resorcine extracted with ether.

Resorcine crystallizes in colorless plates or columns, and dissolves readily in water, alcohol, and ether. It melts at 104° C. (219° F.), and boils at 271° C. (520° F.), and can be obtained perfectly pure by distillation. It is claimed that it can be made in Switzerland for $4 per kilo. (about $1.80 per pound), but we find it quoted in German price lists at from $7.50 to $10 per kilo., or about twice the price of salicylic acid. To some extent the price will depend upon the demand.

Resorcine is not poisonous in moderate doses. From 25 to 30 grains is required to produce any marked effects. It has been found to reduce the temperature in febrile complaints, but its effect is of short duration, and unpleasant after-effects have been noticed. One of its isomers, hydrochinone, is preferred for use in fevers, the dose being smaller. The third isomer, pyrocatechine, has powerful toxic properties.

Andeer has recently investigated the properties of resorcine, and finds that it possesses the power of stopping decay. A one per cent. solution of chemically pure resorcine will stop the development of fungi and mould. In every degree of concentration it coagulates albumen and precipitates it from solution, on which account it may be used as a caustic to remove unhealthy tissue. In crystals it cauterizes as powerfully as lunar caustic. In homœopathic doses resorcine will preserve ink and colors, which would otherwise mould quickly, and does not injure the color. To stop fermentation completely requires a rather strong solution of one and a half to two per cent. Dr. Koller prophesies a great future for resorcine, which he says will be the disinfectant and anti eptic of the physician, the druggist, and the chemist. It must not be forgotten, however, that resorcine is too powerful a reagent to be taken internally in unlimited amount.

The chief use of resorcine, up to the present time, has been in the manufacture of fluorescine, which is obtained by fusing together resorcine and anhydrous phthalic acid. Eosine, one of the most beautiful shades of pink, is a bromine compound of fluorescine. Several other dyes, of more or less value, can also be prepared from resorcine.

ANALYSIS BY PHOTOGRAPHY.

The aid that sunlight may give in chemical analysis has been but little understood. The study of the color of flames suggested to Bunsen an ingenious series of flame reactions, and led him imperceptibly to the invention of the spectroscope. Next came the absorption spectra, which enable the chemist to detect minute traces of mineral and organic substances. Professor Vogel has developed this subject very fully. Professor Tyndall met with some remarkable results in the absorption of radiations in organic compounds. Recently Captain Abney has published some discoveries in connection with spectrum photography. He employed a three-prism spectroscope and a photographic camera, and in front of the slit of the collimator placed various liquids in tubes, and made the beam of light from an electric light travel through them. He succeeded in photographing various bodies in the ultra red, such as water, acids, ammonia, the alcohols and their iodides, benzol, and aniline, about sixty in all. Water, chloroform, the alcohols, and other substances containing hydrogen gave certain absorption lines in positions in which hydrogen lines exist. When chloride or sulphide of carbon was spectroscoped nothing at all appeared; so the only conclusion that could be reached was that, in order for there being any special absorptions, hydrogen must be present in the liquid. The only effect of the addition of oxygen seemed to be that the rays between the hydrogen lines were more or less blotted out. It would seem as if by spec-

troscoping an unknown substance a very fair guess can be made at its constitution, which will certainly be a great triumph for photography.

MEMORANDA IN THE ARTS.

NEW METHOD OF INLAYING WOOD. — Foreign technical journals describe a new method of inlaying wood recently invented in England. A veneer of the same wood as that of which the design to be inlaid consists — say sycamore — is glued entirely over the surface of any hard wood, such as black walnut, and allowed to dry thoroughly. The design is then cut out of a zinc plate, about one twentieth of an inch in thickness, and placed upon the veneer. The whole is now subjected to the action of steam, and made to travel between very powerful cast-iron rollers of eight inches in diameter, two feet long, two above and two below, which may be brought within any distance of each other by screws. The enormous pressure to which the zinc plate is subjected forces it completely into the veneer, and the veneer into the solid wood beneath it, while the zinc curls up out of the matrix it has thus formed, and comes away easily. All that now remains to be done is to plane down the veneer left untouched by the zinc, until a thin shaving is taken off the portion forced into the walnut, when the surface being perfectly smooth, the operation will be completed. It might be supposed that the result of this forcible compression of the two woods would leave a ragged edge, but this is not the case, the joint being so singularly perfect as to be inappreciable to the touch; indeed, the inlaid wood fits more accurately than by the process of fitting, matching, and filling up with glue, as is practised in the ordinary mode of inlaying.

A LEGEND IN CONCRETE. — A ghastly "cast from the life" is that which they show in Algiers. It was taken many hundred years ago (so the legend ran) by inclosing a Moor in cement and using the block for the mole that runs out into the Mediterranean. The legend had it that the victim was a captured Moor who had been brought up a Christian, and on being recaptured by his countrymen refused to abjure Christianity and believe in Mohammed. They say that the legend was so particular and so persistent, pointing out the very spot where he was buried, that on an occasion of repairing the mole the block was fished out, opened, and discovered to contain an exact mould of a man, his beard, moustache, and turban being plainly visible.

WASTE CORK. — The demand for corkwood waste is very large, it being used for patent fire-lighters. Lately it has been used in France for luminous gas. MM. d'Alna and Martin propose distillation in close vessels. They have obtained permission to try this cork-gas at the Opera House in Paris. The fragments of cork, consisting of old bottle-corks, and pieces got in stripping the first bark of the cork oak, are heated in a special retort, which is adapted to the gas-apparatus of M. Schreiber, of St. Quentin. The gas obtained burns with a beautiful flame. It does not contain sulphides, and it can be produced at a low price. Its purification is effected simply by passing through a water purifier and a column of lime.

A BIG BREWERY. — Bass's ale has gone with John Bull round the world, and the manufacture of the bitter beverage has come to assume enormous proportions. It is said that the area of the first Bass's brewery was that of a moderately large garden. That of the sons occupies freehold business premises extending over forty-five acres, and more than one hundred acres of leased property. Then steam power was unknown in the place. Now there are 32 steam-engines, 9 locomotives, 2 portable engines, and 100 cart horses. The employees number nearly 3000, while, in addition, hundreds are required to manage the firm's business all over the United Kingdom. Bass & Co. pay £286,000 in taxes yearly, or about $1,144,000.

THE MANUFACTURE OF VINEGAR. — A German with the suggestive name of *Wurm*, has established a factory at Breslau for the manufacture of vinegar from alcohol and water by the aid of *Mycoderma aceti*. The operation is performed in large wooden vats, provided with covers pierced with minute holes, and pipes for the renewal of the acetified alcohol and the withdrawal of the vinegar when it has reached the proper strength. The operation is begun by adding to the vat of water 2 per cent. of alcohol, 2 of ordinary vinegar, and 0.01 per cent. each of potassium, calcium, and magnesium phosphates, and 0.02 per cent. of ammonium phosphate. The temperature is kept at about 80° F. The surface is then sown with a layer of *Mycoderma aceti*, and the lid fastened down. The acetification is said to proceed at more than double the usual rate. The phosphates form the natural food of the mycodermæ, and keep them in good health and condition.

THE IMPORTATION OF ANILINE COLORS. — It is stated that not less than 700,000 pounds of aniline were imported into this country in 1880, the greater part coming from Germany and Switzerland, At an average value of $4 per pound, these were worth $2,800,000, and paid a duty of $1,300,000. Notwithstanding the heavy duties imposed on these colors, their manufacture in this country does not seem to flourish, and we know of but two establishments where they are made at all, and there only the reds and blues.

GLASS FOR WINDOW BLINDS. — It is not so very long since glass windows were first used, and now comes an inventor who proposes to make window blinds of glass, and why not? They can be made of any kind, colored, plain, or engraved, and never need painting. They will serve to exclude vision from the outside, yet admit more or less light, which is softened and diffused so as to prevent injury to eyes or to delicate carpets and upholstery.

THE COAL-FIELDS OF ENGLAND. — Edward Hall, in his recent work on the coal-fields of Great Britain, estimates the quantity of coal yet to be worked in Great Britain and Ireland, and at a depth not exceeding 4000 feet: —

In visible coal fields . . .	79,725,000,000 tons.
In concealed coal measures .	56,273,000,000
Total tons	136,028,000,000

In 1878, there were 130,000,000 tons taken out, and at this rate the supply will last for more than 1000 years. The annual production of coal over the whole globe is now said to be 289,000,000 tons.

HINTS AND RECIPES.

AMMONIA AND PETROLEUM. — M. Schlumberger has communicated a note on the "Automatic Extinction of Petroleum Fires" to the Société Française d'Hygiène. Many accidents are caused, he remarks, chiefly by imprudence, by the ignition of this substance. The druggist or oilman in going into the cellar where it is kept does not always take due precaution, and a disastrous explosion is the result. A method of extinction is now proposed, which is recommended to be made compulsory under police regulations. On each cask of petroleum place a large bottle of liquid ammonia; the glass will necessarily be broken at the least explosion or when in contact with the flames. The vapor of ammonia will instantly be liberated, and form an automatic mode of extinction.

BLACK DYE FOR WOOD. — The following new process is published in the *Pharmaceutische Zeitschrift für Russland:* First sponge the wood with a solution of chlorhydrate of aniline in water, to which a small quantity of copper chloride is added. Allow it to dry, and go over it with a solution of potassium bichromate. Repeat the process twice or thrice, and the wood will take a fine black color, unaffected by light or chemicals.

FREEING BENZINE FROM OFFENSIVE ODOR. — According to Mr. Fairthorne, benzine may be freed from all offensive odor by shaking it up well with quicklime, — about three ounces to the gallon.

OXIDIZING SILVER. — Dr. Ellsner says that there are two distinct shades in use: one produced by chloride, which has a brownish tint, and the other by sulphur, which has a bluish-black tint. To produce the former, it is only necessary to wash the article with a solution of sal-ammoniac; a much more beautiful tint may, however, be obtained by employing a solution composed of equal parts of sulphate of copper and sal-ammoniac in vinegar. The fine black tint may be produced by a slightly warm solution of sulphuret of potassium or sodium.

SALT AS A PRESERVATIVE OF TIMBER. — Fourteen years ago, a Mr. Sterling, of Monroe, Michigan, placed two gate-posts of white-oak in front of his residence. When they were set, he bored into the top of each, with an inch and a half auger, a hole three inches deep, filled it with common salt, tightly plugged it, and coppered the posts. Having occasion recently to change the location of the posts, he found them as sound from top to bottom as the day they were planted.

Agriculture.

ENSILAGE.

THE treatment of the ensilage question by the newspapers has been thus far largely empirical, and well calculated to mislead in a correct understanding of the subject. So long as writers or correspondents of the agricultural papers persist in their so-called experiments, by which they endeavor to show that "out of nothing they obtain something," a delusion will exist which is detrimental to the interests of farmers. In the accounts published, one is led to believe that it is the *quantity*, not the *quality*, of the fodder put into the silos that makes them so valuable and remunerative. No distinction is made in the quality or kind of corn fodder to be ensilaged; the point is to select the kind which gives the greatest *bulk*, and therefore one well-known experimenter in order to turn a penny, recommends in his book on silos, a seed corn which gives enormous stalks, and this seed can be obtained only of *him*, at a good round price. If any one wishes for this variety of rubbish to crowd into his silos, it will save money to buy the white Southern corn at fifty cents a bushel, rather than pay that much for a *pint* to "the only man who has it to sell."

It will be well to remember that the great value of silos is to preserve in convenient form for feeding good varieties of animal food, and farmers cannot afford to build expensive silos to be filled with coarse material, but little better than ordinary brush-wood. The value of fodder depends entirely upon the amount of nutritive material it contains, whether it comes to the animals from the dry mow or from the steaming silo. The best variety of green-corn stalks is the sweet variety, cut at the right time, and raised under proper conditions. One farmer may fill his silo with coarse corn butts, raised by broadcast sowing, and his animals, fed on the ensilage will al-

most starve, and in his view, ensilaging is a failure. Another may fill his with good sweet corn stalks, raised with care in drills and in the sunlight, and his results will be so different that he praises silos extravagantly. It is certainly true that success in ensilaging is largely due to skill in doing the work, and in having well-constructed pits; but this does not supply the place of good fodder: this is the vital point.

We are glad to notice that at the New Jersey experiment station some examinations of ensilage have been made bearing upon these points. Ensilage from nine different silos has been analyzed, and we give below tabulated results which are of much interest.

In this table the samples have been arranged with reference to their percentages of water and carbohydrates: —

	Loss at 212° F. Per cent.	Proteine. Per cent.	Fat. Per cent.	Fibre. Per cent.	Ash. Per cent.	Carbohydrates. Per cent.
Mr. Mills, Pompton, N. J.	77.04	1.02	0.68	6.85	1.00	13.04
Mr. Morris, Oakland Manor, Md.	78.51	.88	0.62	6.43	1.53	12.03
Buckley Bros., Port Jervis, N. Y.	80.86	1.27	0.67	5.47	1.00	10.73
Coe Bros., West Meriden, Conn.	82.10	1.21	0.71	5.34	1.02	9.63
College Farm, New Brunswick, N. J.	81.52	.94	0.65	5.18	1.43	8.28
Mr. Platt, Suffield, Conn.	83.36	1.06	0.73	5.76	.81	8.08
Whitman & Burrill, Little Falls, N. Y.	83.54	1.01	0.50	5.85	1.40	7.55
James Lippincott, Mt. Holly, N. J.	84.29	1.37	0.30	4.69	1.26	7.91
Dr. J. M. Bailey, Billerica, Mass.	84.87	1.06	0.45	5.61	.98	7.03

The results here afforded show striking and important differences in the nutritive value of the fodder from the different silos. It will be noticed that the specimen from Mr. Bailey, at Billerica, stands *lowest* in amount of *fat* (only 0.45 per cent. to Mr. Mills's 0.68), and in carbohydrates there are still more striking differences; the Billerica ensilage giving only 7.03 to Mr. Mills's 13.04, or almost two to one in favor of the Pompton ensilage. Mr. Bailey, we understand, ensilages the heavy coarse corn fodder. The College Farm in the list also makes a poor showing, but better than Billerica. It is evident, as observed by Professor Cook, that Mr. Mills could make up a full ration for a cow of 1000 lbs. live weight by feeding daily eighty pounds of his ensilage and five and one half pounds of cotton-seed meal; while at the College Farm, with five pounds of cotton-seed meal, one hundred and twenty pounds were necessary. In these rations nearly all the carbohydrates needed and a portion of the proteine and fat are furnished at a very low price by the ensilage; the balance of the proteine and fat is drawn from the cotton-seed meal. If desirable, a much smaller quantity of ensilage could be used, and the carbohydrates given in form of corn meal or any feed rich in these compounds; in ensilage they can be had, however, much cheaper than in any feed known to us at present. One thing must be considered: if the quality of the ensilage obliges the farmer to feed his cows more than eighty or ninety pounds daily per head, there is reason to fear that they will scour. The amounts fed by the above-named gentlemen have varied from sixty-five to eighty pounds, and with these amounts no trouble whatever has been experienced. We therefore conclude that if the ensilage is of first-class quality eighty pounds per day will furnish an animal with the full amount of carbohydrates; if it is of medium quality, it will be safer to limit the amount to about ninety pounds, furnishing the rest of the carbohydrates in form of feed or straw.

NITROGEN IN PASTURE AND ARABLE LAND.

In one of the series of papers on "Fertility," to which we referred last month, Dr. Lawes gives some interesting facts concerning the amount of nitrogen in pasture land at Rothamsted that had probably been undisturbed for centuries, and perhaps never tilled at all, compared with the amount in adjacent land, on which wheat and other grain crops were grown at least 250 years ago (though there are no data to show how many years it was cropped in succession), and which for the last forty years has been under careful experiment in raising unmanured crops. The influence of cultivation in diminishing the stock of nitrogen, and some of the lessons to be drawn from the experiments, are well set forth in the following paragraphs: —

The soils of the pasture land in Broadbalk field, as also of that in the adjoining inclosure, have been submitted to careful analyses, and we find that they do not differ materially from each other. After removing all vegetable matter, roots, etc., amounting to several tons in weight per acre, the first 9 inches of the finely sifted mould contain 5700 lb. of nitrogen, while the second 9 inches contain about 2200 lb. more. In these experiments the analysis was not carried below 18 inches, but in another plot of pasture, of the same character, a short distance off, the analysis has been carried to a depth of 54 inches from the surface. Between 18 and 54 inches the nitrogen gradually declines; still, the quantity between these two latter depths would amount to about 5000 lb. per acre, or about 1 lb. to every cubic yard of soil. If we assume the surface soil to be 9 inches deep, we have 5700 lb. of nitrogen in the surface soil, and 7200 lb. below it, making altogether nearly 13,000 lb. per acre within reach of the roots of some of our agricultural crops. This nitrogen, with certain minerals, forms the stock of fertility which could be drawn upon by those who first commenced growing arable crops.

The Rothamsted experiments had been carried on by us for some years before we attempted to sample and analyze soils; consequently the composition of my arable land, at the time it was first brought under experiment, is not based upon actual analyses; still, the analyses made since that period in the various fields have been so numerous that it is not difficult to fix, within some reasonable limits, the composition of the surface soil. I am disposed to estimate the amount of nitrogen in the first 9 inches of the Broadbalk soil in 1840 at between 3300 and 3400 lb. per acre; the second 9 inches at between 2100 and 2200 lb.: this would give a total stock of 5500 to 5700 lb. per acre, which shows the very considerable reduction of 2400 lb. per acre in the amount of nitrogen contained in the arable land, as compared with that contained in the pasture.

I may observe there is nothing new in the fact that pasture contains a much larger stock of fertility for the crop to draw upon than arable land. Mr. Caird, for instance, while discussing the possibility of our foreign supply of wheat coming to an end, refers to the stock of fertility existing in our pastures which might be rendered available. It is also further confirmed by the saying that the conversion of pasture into tillage makes a man; and if, as is certainly the case, the accumulation of the lost nitrogen in the soil is necessary to the existence of a pasture we can readily understand that the converse process of converting arable land into pasture might be said to break a man. . . .

There is every reason to believe that the nitrogen in the soil which lies below the depth of 9 inches is available for vegetation; still, the amount of roots which penetrates below this depth is so small, as compared with the number of those that feed nearer the surface, that any reduction which may occur in the amount of the nitrogen at the lower depth must be comparatively small, and difficult to estimate by analyses unless periodically taken at very long intervals of time. The measurement of such changes as may occur must therefore be left as a legacy to a succeeding generation.

Since 1839 the Broadbalk field has grown one crop of barley, one of peas, one of oats, and thirty-eight crops of wheat. In 1846, 1856, 1865, 1868, and 1869, the soil of various parts of the field was analyzed, and it is from the data thus furnished that my estimates are made.

In a lecture delivered by Dr. Gilbert in the South Kensington Science Conferences in 1876, he gave in a table the amount of nitrogen removed in the unmanured produce of wheat and straw as follows: Eight years, 1844–51, 25 lb. per acre per annum; twelve years, 1864–75,.16 lb. per acre per annum.

In a recent paper on the home produce, consumption, and imports of wheat, we estimated the annual decline in the yield of the unmanured wheat crop at from one third to one quarter of a bushel per acre per annum. This in forty years would be equal to from 10 to 13 bush. as the reduction of the crop due to exhaustion.

With regard to the nitrogen in the soil, each analysis shows a reduction in the amount per cent. as compared with that which preceded it. The difficulty consists in fixing the actual amount of such reduction. I am disposed, however, to estimate it at from 1200 to 1400 lb. per acre during the forty years, which would be considerably more than the amount of nitrogen carried off in the crops of wheat.

From what I have previously said respecting the production of nitric acid, and its liability to be washed out of the soil by drainage in the absence of vegetation, it might be expected, in regard to the continued growth of a crop like wheat — which ceases to collect food from the soil early in the summer — that considerable losses would have taken place by such drainage in the earlier periods of the experiment. Unfortunately, however, we had no drainage water collected from the field at those periods. At the present time the composition of the drainage water of the unmanured land rather indicates that the loss of nitrogen by drainage is not more than what we might expect would be supplied by the rain-water falling upon the land.

To sum up this part of the subject, we have evidence of the very large loss in the accumulated stock of nitrogen, based upon the assumption that my land was originally pasture; there is a further large loss during the period in which the land has been under experiment and growing unmanured corn crops. The crops are declining; the amount of nitrogen removed in the crops each year is declining; and, further, a considerable reduction of the nitrogen in the first 9 inches, with an indication of a small reduction in the second 9 inches, is shown by different analyses of the soil itself.

BAD TASTE IN GARDENING.

In England there seems to be a growing reaction against the extremely artificial styles of "carpet bedding" and the like that have been the fashion for some years in gardening. A writer in the *Gardener's Chronicle* says: —

"I seemed to see a long border by the side of a broad gravel path, and along the edge of the path for the breadth of a foot or more the bed was gleaming with the yellow glory of the vernal crocus. And I also seemed to see the same border a few days later with all its glory gone, and in place of it a golden belt a thick ugly stubble of close shorn leaves.

I dare say the reader has often seen the like himself, and seeing has shuddered at such a barbaric sacrifice to the false god of tidiness. Such a sight is a sure token that the garden is in the hands of one who is a gardener only in name. Our language is sadly in want of a new term to save us from the wrong of using the grand old name of gardener when we wish to speak of men who, though they are intrusted with the charge of gardens, and may be often diligent, honest, and in a certain way successful, have no real love for flowers, and none of the true gardener's instincts. The fashionable Roman of the times of the Empire, whom the pride of a luxurious life had utterly estranged from nature, used to call his gardener a *topiarius*, or 'object-maker,' because his chief duty was to clip trees and shrubs into fantastic images of animals, ships, and other objects. In like manner many of our fashionable modern gardeners seem to me to be 'object-makers.' To them a flowering herb or shrub is not a living being with a beauty of its own, bred out of a long ancestral struggle for existence, and therefore seen at its best amid its natural surroundings, — a living being, with habits, feelings, longings, to satisfy which its life is one long endeavor, and which unsatisfied must bring shortcomings, and in the end death. They look on foliage and flowers as mere objects, with certain turns of shape and certain shades of color, — mere lifeless units, to be put in or taken up where and when they please, according as they need material to work into their carpet beds, or build up into their glaring parti-colored knots. Like their Roman forbears, the weapons they mostly love are the shears and the knife; and the enemies against which they fight with stubbornness and zeal are leaves."

PRACTICAL HINTS.

Charcoal for Fowls. — There is one thing which nature does not supply, and which civilization renders quite necessary to fowls. It is charcoal. Charcoal made of wood does not answer the purpose; it has no taste of food, it is not attractive to fowls, and is seldom eaten. But if any one will put an ear of ripe corn into the fire until the grains are well charred, and then shell off the corn and throw it to the flock, he will see an eagerness developed and a healthy constitution brought about, which will make a decided improvement. All pale combs will become a bright red, the busy song which precedes laying will be heard, and the average yield of eggs greatly increased.

Currant Worms. — A writer in the *Fruit Recorder* says there is no necessity of breeding currant worms. This is done by leaving bushes untrimmed, the worms always attacking the new growth first. He says: "My plan is this: In starting a currant patch I confine the bush not to exceed from one to three main stems, and give all the strength of the root to their support. As hinted above, sprouts will start from the roots each spring; but they must be rubbed off when about six inches long. All currant growers are aware that worms first make their appearance on the new growth and then spread over the bush. Consequently, no sprouts, no worms. This is just as plain as that two and two make four. I have followed this plan for the last two years to my satisfaction, and have barely seen the effect of worms on one or two bushes where my plan was not fully carried out. But such currants I never saw grow, the common red Dutch being nearly as large as the cherry currant and a better bearer. I had a few bushes that actually broke down from their load of fruit."

Animals with Broken Legs. — A correspondent of the *Rural New Yorker* advises stock-growers not to be in haste to destroy any animal that may break a leg, for by means of plaster of Paris and some bagging strips the limb may be set and supported until the fractured bone unites again. His plan has been, both with calves and sheep, to wind the strips of bagging about the broken limb, plaster over with calcined plaster mixed to a thin paste, wind other strips over that and apply more plaster, the leg being fastened to splints of wood until the plaster sets. The animal would limp around for a few days on three legs, but recovered without blemish.

GLEANINGS.

The Nuisance of Fences. — An exchange remarks that the New York law forbidding the pasturing of cattle in the streets and roads has abated "many nuisances in the shape of unsightly fences. The most costly and artistic fence deforms a fine landscape. Fences must sometimes be tolerated as necessities, but should never be regarded as ornaments. The necessity for them is far less than has been supposed. The modern discovery that fences are to keep cattle in, not to keep them out, is a valuable one. If you have a sow and pigs, fence off a lot big enough to keep them in, but don't oblige your neighbors to support two miles of road fence to keep them out. Unsightly fences are disappearing in many districts, and it is probable that where little stock is kept, it will soon be cheaper to cut their feed and carry it to them than to fence pastures. If the pens that we see in our country villages were taken away, with proper care, all would live in a beautiful park; this would foreshadow and aid the removal of social and sectarian barriers, a consummation devoutly to be wished. The change of public opinion in regard to fencing has been a pleasure and a surprise. In many places we can hardly see a fence, and rods of old fencing may be had for the asking."

American Pork in England. — The London *Medical Times and Gazette* says: "Although up to the present time no authenticated case of trichinæ in American pork has been reported to the Local Government Board, that department has determined to issue a circular warning consumers of hams and bacon to cook those viands well before eating, in order that no unpleasant consequences, such as those resulting sometimes from their consumption abroad in a raw state, may ensue. According to a statement furnished to the Privy Council, England imports yearly from America seven hundred millions of pounds of pork. This is but about a fourth of the quantity actually raised in that country annually, and as the greater portion of the rest is consumed in America, the absence of disease caused by trichinæ in the human frame is adduced in favor of the wholesomeness of American pork generally."

Preservation of Meat by Dextrine. — In *Comptes Rendus*, M. J. Seure describes some experiments made by him in drying and preserving meat by means of dextrine. Of three specimens exhibited before the French Academy the first was a slice of lean meat which had been buried in dextrine, and left exposed to the air on a shelf in a closet for twenty months. The meat had become mummified; but, on putting it in water, it separated from the dextrine, and assumed its original physical character. The second was meat which had been chopped up coarsely and mixed without any particular care with dextrine, so as to obtain a thick paste. This paste was dried in the air, and retained its properties like the former. The third was meat beaten to a fine pulp with dextrine and run into a mould, the result being a very hard, dry, homogeneous cake, of a handsome appearance. Each of these specimens, when exhibited, had been preserved for the same length of time, — twenty months.

The fertilizing material which might be saved in any farm house, and which is ordinarily wasted, would more than furnish the family with garden vegetables for the season.

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, MAY 1, 1881.

TRANSMISSION OF ELECTRICAL FORCE.

It is claimed that by a new device mechanical energy can be transmitted from one distant point to another by means of electrical conductors, so that a descending stream anywhere can be utilized as a source of mechanical power in towns and cities ten or fifty miles distant. This invention is claimed by an Englishman, Dr. Hincks, now in this country, who has constructed the apparatus, and has formed in New York a company with a large capital, to put it in practical operation. The construction of small motors propelled by electricity has been accomplished for many years; ever since, in fact, the discovery of the electro-magnet and methods of changing polarity by automatic devices. The new motor claims to be very much more than a plaything; a power, in fact, which is capable of propelling heavy machinery and doing the work of steam in all its varied applications. We were promised last winter a private *séance* in this city with this new wonder, but there was a hitch somewhere in the arrangements, and it was transported to New York without having been seen, so far as we can learn, by any one. The machine was constructed here, and it was stated that no unemployed steam-power could be found in the city of sufficient capacity to test it. Dr. Hincks claims that his machine is no untried device, it being at the present time at work in England and Wales, in the mining districts, doing heavy work in tunnels at a distance of ten miles from the mountain stream, which is the source of power.

If the important end has been accomplished of changing mechanical energy over into electrical force, and then transmitting the same long distances by means of a wire, and again changing it to mechanical energy, so as to drive machinery, certainly results are reached of the highest consequence in industrial progress. It is claimed that this is accomplished with a loss of only twenty-five per cent. of the original power; or, to state the matter a little clearer, a turbine wheel affording one hundred horse-power at a stream can have seventy-five per cent. of the same delivered to shafting ten miles distant, the only medium of communication being a copper wire $\frac{3}{16}$ of an inch in diameter. A ten horse-power water-wheel, located anywhere on a farm or estate, could have more than seven tenths of its power brought to the farm buildings and dwelling, and used for lighting, warming, pumping, and all other uses for which it might be wanted. The development and practical results of a plan so magnificent as this will be watched with interest by every one.

LABOR-SAVING DEVICES FOR SEDENTARY WORKERS.

This is the age of labor-saving contrivances, and the saving of labor is generally an obvious gain. In some instances, however, it may be indirectly a loss or an injury. Possibly this is true of certain devices intended for the use of literary men, which, though very convenient and unquestionably useful under some circum-

stances, may be objectionable in others as tending to make sedentary labor more continuously sedentary, and consequently more detrimental to health. A man may now sit at his desk or library table for hours without the necessity of rising and walking across the room to consult a book. A revolving bookcase puts a small library beside his chair, and patent book-rests hold half a dozen volumes open before him for instant reference. All the manuscripts and memoranda that he has occasion to use are classified and filed in pigeon-holes or drawers within easy reach. All the tools and appliances of his art are literally at his fingers' ends. He may write a whole page, if he chooses, without lifting his pen from the paper to replenish it with ink.

On the face of it, all this is as comfortable as it is convenient, and for many classes of workers it may be every way economical and advantageous. If one has a definite "stint" to do each day, it may enable him to get through with the task sooner, and to gain more time for out-of-door exercise or recreation; or if one must do a certain amount of work to "keep the pot boiling," it may be only by means of these labor-saving helps that he can get such exercise and recreation at all. We can easily imagine a great variety of cases in which not only no harm results from the use of these devices, but they are directly or indirectly productive of good. Sometimes, however, we fear that the apparent advantage may be really a disadvantage, the seeming gain an ultimate loss. Much of course depends upon individual temperament and habit, but for many brain-workers, who have to be in the harness a good part of the day, we have no doubt that it is well to be compelled to leave one's chair now and then. The mere change of position, the slight relief to one set of overstrained muscles, the momentary exercise of others long kept inactive, all are good for the body, as the diversion of attention from what is immediately under the eye is for the mind. To go across the room, to take down a heavy book from a shelf and hold it in the hand while looking up some little point, is exercise d ffering not in kind, but only in degree, from a walk of a mile. One returns to his writing rested and refreshed by it, and the stimulus it gives to exertion soon makes up for the loss of time.

A stylographic pen is an admirable contrivance for some kinds of work. Reporters, students taking notes of lectures, clerks who have to make entries or memoranda here and there in a large warehouse, and everybody who must write "on the wing," so to speak, find it extremely convenient to have pen and inkstand in one and always ready for use; but for a man writing steadily at his desk we believe that the relief to the muscles of the hand and arm in pausing to dip the pen into the inkstand is well worth the few seconds it takes. In the long run it may be just enough to save one from "writer's cramp" or "pen-palsy." We have somewhere read or heard of a writer who kept his inkstand on another table, in order that he might be sure of rest to his fingers, and of some leg exercise withal, by having to walk across the room whenever he needed to recharge his pen. That was perhaps overdoing the thing, — or would be for most people, — but the principle was a sound one, and should be kept ever in mind by sedentary workers. In any mechanical labor that keeps one set of muscles in constant and rapid exercise, there is rest and recuperation in occasional change of motion, however slight and momentary. The heart, whose throbbing labor knows no intermission by day or night from birth to death, rests for an instant between its successive beats, and the interval, though almost inappreciable, is necessary to the healthy performance of its functions. No part of our muscular or nervous system was made for incessant and unvaried activity.

A PROBLEM.

THE following item is taken from *Nature*: —

Mr. A. R. Wallace, the eminent naturalist and author, is to receive a pension from the British Government of £200 a year for his valuable researches in the promotion of zoölogical and biological science.

It is indeed a remarkable fact that the two scientists in England who have received the highest honors on the part of the government, scientific bodies, and learned men in the past five years are both believers in and defenders of a class of phenomena which is scouted by most of their admirers as nothing more than trick and fraud. Dr. Crookes, the eminent chemist and physicist, and Mr. Wallace have devoted many years to laborious experimental investigation of the so-called "spiritualistic" phenomena, and have published the results, which are a full admission of its verity. How can it be possible that these careful, cautious, cool, and most accomplished learned men can be mistaken in this one department of research, when they are trusted, honored, and applauded for their labors in all others? Who can satisfactorily explain this?

TRAVELLING IN MEXICO.

THE following extracts are from a letter sent us by a friend in Texas, who has lately been travelling in Mexico: —

In Mexico there are no hotels nor boarding-houses, except in large cities where foreigners reside. As stage-coaches or other public conveyances are rare, the travel is mostly done on horseback. The saddle is generally mounted with gold or silver, and richly ornamented. The rowels of the spurs are as big as a silver dollar, but the points are very dull. The spur seems more intended to frighten the horse than to hurt him. The Mexicans are expert riders, being so much in the saddle.

In travelling quite a retinue of attendants is necessary. You have to take along your bedding on a pack-mule, with servants to attend to the mules and the luggage, and a cook to prepare your meals. In many parts of the country it is necessary to take your provisions with you, and all the conveniences for camping out. In some places it is difficult to get drinking-water for yourself and your animals unless you buy it.

If you cannot reach a settlement at night, you camp out; in a town, you can usually rent a room, entirely unfurnished, for the night. The servants spread the bedding on the floor, purchase victuals in the market, and prepare the meal in Mexican style. Bedsteads, tables, and chairs are luxuries known only to the wealthy among the native inhabitants.

Butter the Mexicans do not know how to make. The sugar is a very crude article, inferior to our darkest brown sugar, and is sold in little cones, weighing about a pound. Cheese is made in cones of similar size, from goat's milk. Cow's milk is used only fresh, and is never made into cheese or butter.

Horses in Mexico are never used for draught purposes, but are employed only for riding. Mules and oxen do all the work of transportation.

The fine wines made at El Paso on the Rio Grande are transported in skins, as in Bible times. Bottles, kegs, and barrels are almost unknown. In many portions of the country timber is too scarce to be used for casks; and a frame-house would be a very expensive affair.

American influence will soon instil new life into this primitive people. The railroads now building will be the means of civilizing the country, developing its immense natural resources. It has a beautiful climate and vast mineral treasures, which only await this foreign stimulus to be made a source of national wealth and prosperity.

METEOROLOGY FOR MARCH, 1881.

THE sum of my observations on the weather for the past month has been as follows: —

Average Thermometer.		Lowest.	Highest.	Range.
At 7 A. M.	32.35°	24°	40°	16°
At 2 P. M.	41.07°	33°	50°	17°
At 9 P. M.	34.39°	28°	40°	12°
Whole month	35.93°	24°	50°	26°
Last 18 Marches	31.64°	22.61° in 1869	39.18° in 1878	16 57°

The average barometer for the month was 29.623 inches; the lowest 29.00 on the morning of the 31st, the highest 30.18 on the 15th, morning and evening, a range of 1.34 inches. The sum of the daily variations was 6.40 inches, giving an average daily movement of .207 of an inch. The largest daily movement was .55, on the 30th, in connection with a fall of snow and rain.

The face of the sky in 93 observations gave only 31 fair, 16 cloudy, 26 overcast, 12 rainy, and 8 snowy. The amount of rain, including 7 inches of melted snow, was 5.52 inches. The average amount for the past thirteen Marches has been 5.565 inches; the lowest 1.30 in 1874, and the highest 10.22 in 1877, a range of 8.92 inches. There was no thunder nor lightning observed during the month.

The direction of the wind in the usual observations gave an excess of 42 northerly and 23 westerly over the southerly and easterly, indicating the approximate average west 61° 20′ north, or more than five points north of west, or N. W. by N.

It will be seen by the above observations that the temperature of the month was several degrees above the average, and yet the weather as a whole was more than usually disagreeable. One cause of this, doubtless, was the small amount of sunshine. During the past 16 years the average amount of fair observations in March has been 48, while the past month gave only 31, the lowest number in the 16 years. The next lowest were 35 and 36 in 1865 and 1877; the highest number was 63 in 1869. Thus we had only one third of the month fair, and only about five eighths the amount usual in March. On the other hand, we had 20 observations rainy and snowy, and 42 cloudy and overcast, rendering much of the month quite uncomfortable.

Another cause was the large amount of northerly and easterly winds, there being 78 observations of this class, and only 59 of the southerly and westerly; and many of the former were quite severe and moist, giving a chill to every one much exposed.

A still further cause may be suggested in the very low range of the barometer, only 29.623 inches, being the lowest of any month, with but two exceptions (February and April, 1873, which were 29.430 and 29.603), during the six years (1873–75, 78–80) in my tables. Now a low barometer indicates a

rare and light atmosphere, less sustaining to bodily and mental vigor than a dense, heavy one, as it is much easier to swim in very salt water than in fresh. D. W.

NATICK, *April* 6, 1881.

EDITORIAL NOTES.

CHROME INKS. — Several correspondents have inquired whether bichromate of potash can be used instead of the chromate in the so-called "chrome ink." Only the latter will answer the purpose. Others have inquired as to the quantity of the carbonate of soda to be used. About twenty grains to a pint will suffice, or has sufficed in our experience. One writer doubts whether chrome inks can be kept for any length of time without "gelatinizing." He prefers to make the ink in small quantities at a time on that account. Ink made by the recipe given in the JOURNAL for March is limpid enough for use with a stylographic pen — a severe test, certainly — after the lapse of nearly four months. It should be noted that the quality of commercial extract of logwood varies considerably, and this may affect the quantity of the salt required for a stable ink. Other formulæ for chrome inks are the following, commended by Krüger, but we have not personally tested them: —

(1.) Dissolve 1 lb. of extract of logwood in 15 lbs. of water, and add 1 oz. of alum and ½ oz. of yellow chromate of potassium.

(2.) Boil 10 lbs. of best rasped logwood with 100 lbs. of water, down to 80 lbs. When cold, add 1½ oz. of yellow chromate of potassium previously dissolved in 5 oz. of water.

AN ERROR. — The *Detroit Lancet* contains the following item, which is being extensively copied into other journals: —

Chloral was discovered by the French chemist Balard, in the year 1844; but its physiological effects were not determined till 1859, by Guthrie. Special attention was not called to it until 1865, when Dr. Richardson, of London, first introduced it to the profession as a therapeutic agent. It is prepared by heating one part of strong nitric acid with two parts of rectified fusel oil, taking care to collect only that part of the distillate which passes over between 202° F. and 206° F.

Is it possible that our learned contemporary does not know that *nitrite of amyl*, and not chloral, is the substance described?

ACTION OF VEGETABLE ACIDS ON TIN. — Professor Charles E. Munroe, of Annapolis, Md., states that the ordinary fruit acids, such as those contained in apples, tomatoes, rhubarb, lemons, etc., all act upon tin. Some cider which he examined, and which had been stored in a tin fountain, contained 117 milligrams of metallic tin to the liter in solution. In one case persons eating fruit preserved in tin cans were made violently sick, and tin only was found in the fruit. It is suggested that the corrosion of tin pipes by water may be due to vegetable acids in the water.

CREMATION IN ITALY. — Cremation appears to be making considerable progress in Italy. Since 1876 seventy-one incinerations of bodies have taken place at Milan and fifteen at Lodi, making a total of eighty-six. The first crematory furnace set up in Milan was heated by ordinary gas, made on the spot, and passed by means of tubes into the urn. This system, however, had to be abandoned, since it was found to be neither rapid nor economical, five hours being required to complete the operation. Two rival systems are now being tried, — one the invention of Professor Gorini, of Lodi, and the other that of Messrs. Porna and Vennini, of Milan. Both furnaces are heated by wood, and the flames are brought into direct contact with the body; combustion being increased by the introduction of atmospheric air. Cremation does not appear to be a costly process, for the total cost of incinerating a human body at Milan is somewhat under 50 lire, or less than ten dollars. This charge covers not only the fees to the cremation society and to the municipality, but the cost of a niche for the cinerary urn in the columbarium erected for that purpose.

STATISTICS CONCERNING FEMALE DOCTORS. — At the commencement of the Woman's Medical College, in Philadelphia, some interesting statistics were given regarding the success of female physicians in this country. Of 276 that had graduated in the past thirty years, 32 had died, 31 had given up their profession, 151 were then practising.

The incomes of 24 were between $1000 and $2000; of 20, between $2000 and $3000; of 10, between $4000 and $5000; of 3, between $5000 and $15,000; of 4, between $15,000 and $20,000; of 10, less than $1000. The average income was $3000.

Sixty-six were members of medical societies; 51 were married after studying medicine, and 61 before. Of 50 who were married, 43 reported that the practice of medicine had no unfavorable effect upon their domestic life; with 6 the effect was not entirely favorable; with 1 it was unfavorable; 3 were prevented by practice from marrying; 5 gave up practice on account of marriage.

A SCHOOL FOR PLUMBERS. — A course of technical instruction in plumbing and sanitary engineering will be begun soon at the New York Metropolitan Museum of Art, covering a period of two months. Lectures will be delivered by Dr. C. F. Chandler, Mr. C. F. Wingate, Mr. John Buckingham, and others, on Sewer Gas, Water Pollution, House Drainage, Disinfectants, Plumbing Materials, etc.

A PSYCHOLOGICAL NOVEL. — Dr. Hammond's daughter, the Marquise de Lanza, has just completed a novel, to be published by the Putnams, the plot of of which turns upon the idea of double consciousness. The heroine, while in the "second state," engages herself to be married, and when she recovers her normal condition has forgotten all about it. Dr. Hammond will write a preface to the book on the subject of double consciousness.

RELATION OF OZONE TO OXYGEN. — Becquerel is engaged in a course of experiments, with the object of ascertaining definitely whether ozone is analogous to oxygen mechanically condensed, or whether it has attributes indicating that it is the product of a specific modification of oxygen. Although his experiments are not yet complete, they already enable him to say that ozone is not merely "condensed" oxygen. There are few subjects involved in so much obscurity as the true nature of ozone.

POLARIZATION OF SOUND. — Prof. S. W. Robinson, of Ohio, has lately succeeded in polarizing sound waves. This blots out the long supposed distinction between light and sound waves, and must necessarily lead to important changes in the theory of polarization. If the vibrations in sound waves are longitudinal, is it any longer probable that those of light are transversal? If not, how does a wave of polarized light differ from that of unpolarized light?

ATOMS.

EXPERIMENTS with gun cotton, at Woolwich, demonstrate that the transmission of detonation from one mass of gun cotton to another not in contact was so rapid that a row of cotton reaching from London to Edinburgh could be fired in two minutes. — Chamois skins are not derived from the chamois, as many people suppose, but are the flesh side of sheep-skins; these skins are soaked in lime-water and in a solution of sulphuric acid, fish oil is poured over them, and they are then carefully washed in a solution of potash. — An examination of railway *employés* in Brussels has disclosed the fact that 5 per cent. were color-blind, more or less, and, in accordance with the rules, they have been removed from posts in which the ability to distinguish colors is of importance. — Glass floorings are now being made in France, the upper surface moulded in diamonds. — A law has just been enacted by the Ohio Legislature making it a criminal offence to buy, or sell, or use a fraudulent medical diploma; that is, one not issued from a chartered medical college to persons who have regularly studied medicine for the usual length of time. — Professor Huxley has been appointed to the position of Inspector of Fisheries, left vacant by the death of Mr. Frank Buckland. — Students of Kant are offered a prize of 1000 florins for the best popular treatise on that philosopher's views on the ideality of time and space; Herr J. Gillis, of St. Petersburg, will not only give that sum, but will publish the successful essay and pay the profits on its sale to the author. — The engines of the cable-laying steamship Kangaroo recently ran the 9500 miles from New Zealand to St. Vincent without stopping. — It is a curious fact, lately noted by M. Boutigny, that if boiling water be projected on an incandescent surface its temperature falls at once to 97° C.; he is of opinion that this is due to work expended in production of the spheroidal state. — An ingenious philanthropist proposes to diminish the mortality among the wounded in war by tattooing on the soldiers' bodies the principal points where compression may be made in cases of hæmorrhage; life may be lost in a few minutes by a wound of a large artery, and it is thought the soldier might often escape if he knew where to command an artery while waiting for help. — To ascertain if water is hard or soft procure a small quantity of soap dissolved in alcohol, and let a few drops of it fall into a glass of the water to be tried; if the water becomes milky it is hard, but if little or no milkiness results the water may be said to be soft. — A young Russian lady, who was studying medicine in Paris, committed suicide, in December last, by a pistol shot through her head; death was instantaneous, and it was ascertained that the despair of passing her examination, which was to come off the next day, was the cause of the melancholy event. — Asbestos powder, made in a thick paste with liquid silicate of soda, is used with great advantage for making joints, fitting taps and connecting pipes, filling cracks, etc.; it hardens very quickly, stands any heat, and is steam tight. — The question of uniting the waters of Lake Superior and the Red River by means of a canal has been discussed in the Chamber of Commerce of Duluth, and a resolution passed recommending an appropriation of public money for the purpose of a complete survey.

LITERARY NOTES.

MESSRS. H. C. BAIRD & CO., of Philadelphia, have just published *A Technical Treatise on Soap and Candles*, by R. S. Christiani, well known as an accomplished chemist and the author of a standard technical work on perfumery. A practical treatise on these important arts was a desideratum. Morfit and Dussauce (which, by the way, are still issued by the same house), though admirable in their time, were beginning to be obsolete, and Mr. Christiani has done a valuable service in giving us in a handsome octavo of about six hundred pages a complete and comprehensive view of the present condition of the soap and candle industries, with especial regard to the needs of the manufacturer. He describes the materials used, the means of testing their purity and quality, the machinery and apparatus requisite for the manufacture on the large or small scale, full details of all the latest and most improved methods employed, with all the miscellaneous information for which one would naturally refer to such an encycl pædic treatise. A hundred and sixty illustrations help to make the machinery and processes better understood, and a large number of recipes and formulæ for special preparations are included. The book seems to be in all respects thoroughly practical and fully up with the times. The price (postpaid from the publishers) is only six dollars, making it the cheapest as well as the best book of its class. It may be found in this city at Williams & Co.'s.

Medicine and Pharmacy.

FOOLING WITH POISONS.

If the average man were half as ready to profit by the hygienic and sanitary lessons that are read to him, and to bear in mind that "prevention is better than cure," as he is to endeavor to avoid calling in the doctor after he has made himself sick by the neglect or violation of the laws of health, it would be a good deal better for him. The desire to be "his own doctor" seems, like hope, to "spring eternal in the human breast," and often leads to most disastrous consequences. Many a man who, if his horse or cow is sick, sends at once for the veterinary practitioner will run the risk of prescribing for ailments of his own that are on the face of them quite as serious and as much in need of professional treatment. He will take the advice of an ignorant neighbor as to what is "good for" an illness, when he would laugh at the idea of going to the same person for counsel in any other business or concern whatever.

In the days of our grandmothers, when the household *materia medica* consisted of "roots and yarbs," with a few simple drugs like epsom salts, this domestic or "lay" prescribing was less dangerous than in these latter days, when concentrated and powerful agents have become so common and familiar. The household remedies of the olden time were rarely liable to do much harm, even if they did no good. The cure was generally in reality left to nature, though the "roots and yarbs" got the credit of it. But most of the drugs of our day are not of this inert or negative character, and the danger in their use by the ignorant is a real and serious danger. The most powerful medicines that unprofessional people of a former generation ventured to fool with bore about the same relation to those now in vogue that gunpowder does to nitro-glycerine; yet the latter are used even more recklessly than the former ever were. The spread of popular information on physiological and medical topics has made many persons more self-confident and careless in these matters, while the agents they use require vastly greater caution. A little knowledge is not always a dangerous thing, but when it leads a man to think that he can "doctor" himself, in ailments of any serious nature, the old and often-abused proverb is indisputably true.

The recklessness with which some persons will try perilous experiments upon themselves, by the employment of powerful poisons, is well illustrated by a case described in a clinical lecture delivered recently at the Pennsylvania Hospital by Dr. J. M. Da Costa, and reported in the *Philadelphia Medical Times* of March 26th. The patient was a young man, nineteen years of age, who was suffering with arsenical paralysis. He had heard or read of the arsenic-eaters of Styria, and thought he would try to improve his personal appearance by imitating their example. He began with small pinches of the poison, and increased the dose gradually; but after three or four months he found that a most alarming train of symptoms was appearing: sore throat, followed by abdominal pain, vomiting, diarrhœa, and the like. Later he could not stand upon his legs, and his mental "understanding" became weakened, like the corporeal. A course of hospital treatment, which is described at length in the lecture, but which it is not necessary to repeat here, brought about an improvement in many respects, but not in all. In reply to the question whether complete recovery will ever take place, Dr. Da Costa says:—

In the brain, yes. I do not believe that there will be any alteration or serious impairment of the mental powers; the brain-cells will be restored to their normal functions. Will he recover fully the use of his limbs? In the upper extremities, yes; but in the lower extremities I scarcely think that he will ever do so entirely. He may walk about, even without crutches, but I hardly believe that he will recover the use of these wasted flexor muscles of the foot.

Judging by the improvement of the last month, he will come very near to a recovery; but he will never be entirely a healthy man, as he was before he began the habit of taking arsenic in pinches for its beautifying effect.

The moral of the case is obvious, and we need not dwell upon it, except to say that it applies with equal pertinence and force to thousands of other and widely different cases, in which rash and reckless people fool with poisons and potent drugs in the way of self-medication, instead of acting under professional guidance.

THE LIMIT OF DANGER IN THE USE OF ANÆSTHETICS.

According to the *British Medical Journal*, the number of deaths from the use of anæsthetics in Great Britain for the decade ending 1880 was as follows: chloroform, 101; ether, 11; chloroform and ether, 7; methylene, 10. This is certainly a startling mortality, even though distributed over ten years, and the large share of it which is ascribed to chloroform ought to satisfy our British cousins, as well as those who agree with them on this side of the Atlantic in preferring chloroform to ether for anæsthetical use, that they are making a bad choice.

In this connection certain investigations recently made by Professor Paul Bert, and reported in the *Gazette des Hôpitaux*, are interesting and instructive. He made a great number of experiments on dogs, mice, and sparrows, with the following anæsthetics: ether, chloroform, amylene, bromide of ethyl, and bichloride of methylene. His principal object was to determine the differences which separate anæsthetic doses from fatal doses; that is, the proportions in which the anæsthetic agent becomes mingled with the blood in order that it may induce only anæsthesia, or cause the death of the animal. The number of grammes of the anæsthetic to 100 liters of air necessary to produce these effects is as follows:—

	Dog.		Mouse.		Sparrow.	
	Anæsthesia.	Death.	Anæsthesia.	Death.	Anæsthesia.	Death.
Ether	37	74	12	25	18	40
Chloroform	15	30	6	12	9	18
Amylene	30	55	15	30	30	60
Bromide of ethyl	22	45	7.5	15	15	30
Bichloride of methylene	21	42	12	20	12	24

It is seen from these figures that the quantities which cause death are exactly double those that are necessary for the production of anæsthesia. Now, in practice, when chloroform is, for example, poured on a napkin, it constantly happens that a patient is made to inhale twice as much of the agent as is necessary to induce anæsthesia; in other words, the risk is run of getting what *might* prove a fatal dose. It is certainly an alarming consideration that, to produce death, only double the dose necessary for anæsthesia is required. All who have occasion to administer these valuable but dangerous agents for anæsthetical purposes should bear this fact constantly in mind.

RESEARCHES ON TOBACCO-SMOKING.

In the Journal for January (page 10) we gave an abstract of some curious and suggestive experiments in tobacco-smoking, made in Paris by M. Gustave Le Bon. We find in recent foreign journals an account of further researches he has been making in the same direction, a brief summary of which will doubtless be of interest to the reader. M. Le Bon finds that collidine, the new alkaloid obtained from tobacco-smoke (with other aromatic principles, and prussic acid, as well as nicotine) is a liquid of agreeable and very penetrating odor, and as poisonous as nicotine, the twentieth part of one drop sufficing to paralyze and kill a frog. It is the prussic acid and various aromatic principles, he considers, that cause headache, giddiness, and nausea in smoking certain tobaccos that contain little nicotine. Other tobaccos, rich in nicotine, have no such effects. The tobaccos containing most prussic acid and collidine are those of Havana and the Levant. The dark semi-liquid matter which condenses in pipes and cigar-holders contains all the substances just named, as well as carbonate of ammonia, coloring matter, etc. It is very poisonous; two or three drops of it are sufficient to kill a small animal. The combustion of tobacco destroys but a small part of the nicotine, and most of this appears in the smoke. The proportion absorbed by smokers varies according to circumstances, but hardly ever falls below fifty centigrams to the hundred grams of tobacco burnt. About the same quantity of ammonia is absorbed at the same time. Naturally, more of the poisonous principles are absorbed where the smoke is breathed, as in a room; less in the open air. A frog placed in a receiver containing a solution of nicotine, with about one drop of that substance in a little water, succumbs in a few hours. Tobacco-smoke contains about eight millimeters of carbonic oxide per hundred grams of tobacco burnt; but the poisonous properties of tobacco-smoke are not due to this gas, as was shown by the experiments described in January. It is evident, however, that there are poisons enough in tobacco smoke, even if this has to be "counted out."

EDUCATION AND SUICIDE.

Blackwood is one of the most conservative of magazines, and not at all given to "sensational" utterances, but the following paragraph from its columns is somewhat startling, though it is possible that, to a degree at least, it confounds the *post hoc* with the *propter hoc*:—

Professions do not predispose to suicide, but instruction does. No man kills himself because of his trade, but a good many men kill themselves because of their knowledge. Not only has the revival of suicide almost exactly coincided, in time, with the modern extension of schooling, but suicide is now most abundant in the very regions in which schooling is most expanded. The records establish this

beyond all doubt. The inhabitants of countries in which every one can read are precisely those who kill themselves the most. Now this supplies another indication that people do not always make a good use of reading. We knew that fact already, it is true, but we scarcely expected that additional proof of it would be supplied in this strange form. That reading conduces to suicide is a new view of reading, but it is incontestably an exact one, — within limits. We could, perhaps, have imagined, if we had thought about the matter at all, that certain occupations might possibly pave the way, under unfavorable circumstances of health, to thoughts of suicide. We could have wildly guessed, for instance, that newly enlisted recruits, or lighthouse-keepers, or exiles, or public executioners, lead lives in which the self-killing tendency might receive a morbid development; but never, in our senses, should we suppose that village schooling is, indirectly, the most fertile of all the actual origins of suicide. And yet it seems to be so. And if it is not, what is? We have all of us heard so much of "the suppression of crime by education" that we have insensibly acquired the unreasoned belief that education is one natural cure for moral evils. So, perhaps it ought to be. And — to repeat the question — if it is not, what can be? But evidently, as regards this particular evil, education appears to be a provocative rather than a remedy — at least in the form in which we have hitherto applied it. The books which are now being published about suicide on the continent are all deploring, with consternation, the simultaneity of the spread of the alphabet and of voluntary death, and are asking, anxiously, what can be the connection between them. They seem, indeed, to be almost expecting that, if we go on as we have begun, we shall soon see suicide officially recognized by Government as an inevitable result of study (like headaches and spectacles), and placed naturally, all over Europe, under the supervision of the inspectors of schools.

TREATMENT OF SPRAINS.

A MEDICAL correspondent in Philadelphia sends us the following note: —

I observe in the JOURNAL of February, 1881, page 23, a treatment for sprains, by Dr. R. Dacre Fox, to which I beg leave to take exception. He directs warm applications. In my experience it is the very worst thing that can be done — calculated to protract or prolong the cure. I have for thirty-five years, when I was called in time, applied cloths dipped in the coldest water I could get, and kept he part constantly wet by repeatedly applying the water. This I have found to subdue the inflammation and swelling in from 24 to 36 hours; and then I use pressure by gum-elastic straps 2 to 2½ inches wide, which, if properly applied, will press equally on all parts, without the kneading and pads which are recommended. The bandages should be removed at night, wiped with a cloth wet in cold water, hung up to dry, and put on again before the patient gets out of bed. The gum bandages are of recent origin, and I find them far superior to those of muslin in former use. When I apply the bandage I generally allow the patient to use moderate exercise. With this treatment I have never seen enlargement of the joint after sprain, which scarcely ever fails after the hot applications. Each morning, before applying the bandage, the parts should be well rubbed with camphor liniment.

This is evidently one of the subjects on which "doctors differ." We happen to know that some of our best physicians recommend in the treatment of sprains the application of water as hot as it can possibly be endured; and the results have been most satisfactory. Dr. Sargent, the superintendent of the new Hemenway Gymnasium at Harvard College, advises this course in the sprains that not unfrequently occur among the students in their gymnastic practice, and the relief is often almost magical. In medicine, as in other arts, there are sometimes "two ways of doing a thing."

BORACIC ACID IN ERYSIPELAS.

DR. C. G. HUBBARD, of Hornellsville, N. Y., sends us the following note on this subject: —

I often see in your journal remedies recommended for erysipelas. Allow me to mention one which has proved a uniform success in my hands, namely, a saturated solution of boracic acid. Its advantages over other local applications are: (1.) It is soothing rather than irritating to an inflamed skin. (2.) It is as bland and devoid of smell or staining qualities as water. (3.) It is not poisonous in any quantity, so no harm can be done with it. (4.) It is a powerful disinfectant, and the inflamed skin will take on a natural hue in a few days under its constant use. (5.) It can be used around the eyes with no fear of injuring them, as is the case with carbolic acid or copperas. I consider it a specific for erysipelas, if used in time and persistently. Of course tonics should be exhibited also.

In all skin diseases marked by itching, caused by inflammation, boracic acid is the best application I can use. I have cured a hæmatocele of sixteen years' standing, whose sac contained over sixteen ounces of bloody fluid, by daily injections for a month of a saturated solution of boracic acid. Its bland, unirritating, non-poisonous nature, rendering it capable of being applied to any part of the body and in any quantity, and its great efficiency induce me to consider it superior to all disinfectants of the present day. When physicians become acquainted with its merits it will be used more frequently.

THERAPEUTICAL HINTS.

COPAIBA IN SCIATICA. — Dr. H. C. March, in a paper read before the Manchester Medical Society, and reported in the London *Medical Times and Gazette*, records several cases of patients suffering the most severe pain from sciatica, and being suddenly cured by the administration of copaiba. Morphia, chloral, turpentine, quinine, lithia, colchicum, potassium bromide, and potassium iodide, with poultices and liniments in all varieties, had proved unavailing. Dr. March says: "I do not begin with the drug, thinking it better first to empty the bowels, and to relieve any gouty, rheumatic, or anæmic state that may happen to exist; but fall back upon it if the pain continues unabated." He thinks it likely that the remedial property just indicated is due to the drug's well-known power of producing diuresis in certain forms of hepatic dropsy. It seems to have an action on the liver; it certainly stimulates the kidneys; and it exercises some influence on the nervous system. The mixture he gave was bals. copaibæ, ʒiv.; tr. lavand., ʒiv.; tr. hyos., ʒiij.; pot. bicarb., ʒi.; mucilag., ℥i.; aquæ, ℥vi., — a tablespoonful every four hours. But he has since found that the resin of copaiba, given alone and in form of pills, is equally efficacious.

READY METHOD FOR HOT FOMENTATIONS. — Place the flannels in the steamer of an ordinary potato steam-kettle. They readily become permeated with the steam when the kettle is placed on the fire, and can be readily changed without any fear of scalded fingers during the attempt to wring them sufficiently dry, as in the ordinary method.

BENZOATE OF SODA IN ACUTE RHEUMATISM. — Dr. David MacEwan reports in the *British Medical Journal* the results of using benzoate of soda as a remedy in cases of acute rheumatism. The idea seems to have been suggested by considering the close alliance between benzoic and salicylic acids. The author describes five cases, in all of which the effect of the medicine was rapid and satisfactory. The doses given were 15 and 20 grains every three hours. In one of the cases salicylate of soda had previously been given for a fortnight, without much benefit. Dr. MacEwan finds that benzoate of soda possesses the advantage that it does not give rise to the nausea and depression or the unpleasant heat phenomena which the salicylate frequently produces It is most convenient to prescribe it in the form of a mixture. It should be continued in diminished doses for 24 or 48 hours after the rheumatic symptoms have disappeared.

IMPROVED DOVER'S POWDER. — The following, suggested by Dr. J. D. Mitchell, is commended in the *New York Medical Record:* "The preparation is simple, and is made by substituting finely pulverized bromide of potassium for the time-honored sulphate of potassa. The bromide must be ground to a powder, nearly as fine as flour, and will be found to answer all the requirements of the sulphate of potassa as to hardness of particles in promoting 'that minute division and consequent thorough intermixture of the ipecacuanha upon which the peculiar virtues of the compound depend.' This is not all, for the bromide is not only a good mechanical, but a good medicinal, agent in this connection as well. It increases the hypnotic virtues of the compound, and does not diminish, but rather increases, its anodyne properties. The sleep produced by it is refreshing and delirium very uncommon, my patients often remarking that the powder did no make them 'flighty,' as Dover's powder had commonly done. The powder is just as agreeable (?) to take as the old original prescription of Dr. Dover, and its diaphoretic tendency is in no way altered. It works like a charm in many forms of headache."

BROMIDE OF POTASSIUM AND CALOMEL. — According to Professor Taylor, these agents are incompatible. A soluble mercurial compound is formed which is highly poisonous, a kitten having been killed by some of it in the course of an hour and a half.

THERAPEUTIC USE OF PHOSPHATE OF BISMUTH. — According to the *Union Pharmaceutique*, Dr. Tedenat prefers the phosphate of bismuth to the sub-nitrate. The anti-diarrhœic action of the phosphate is identical with that of the sub-nitrate. Thanks to its greater insolubility, however, the phosphate acts in slightly less doses, especially in affections of the stomach. In spite of the acidity of the fluids of the stomach, it is completely absorbed. The dose varies according to the case; generally it is from 1 to 2 grammes. The mode of administration is the same as that of the sub-nitrate. In children it suffices to deposit the desired quantity on the tongue, and give the child the breast or the bottle. The salt is easily drawn into the stomach, and considerable doses may be given in this manner. In adults the remedy is held in suspension in some liquid. In many cases, lozenges of 1 to 2 grammes in weight are very useful; they disintegrate in the mouth, and the phosphate is gradually taken into the stomach.

GLYCERINE IN TRICHINOSIS. — Dr. J. M. Barton, in the *College and Clinical Record*, states that four cases of trichinosis have recovered under large doses of glycerine. This treatment, which has been quite widely recommended, is based on the fact that glycerine, applied to living trichinæ, at once shrivels them up and kills them.

TURPENTINE VAPOR IN WHOOPING-COUGH. — According to a French medical journal, whooping-cough has been successfully treated by Dr. Barety, of Nice, by turpentine vapor. By accident, a child, severely affected, was allowed to sleep in a room recently painted and redolent with turpentine odor,

when noticeable improvement took place. Dr. Barety has since employed this drug, placed in plates, and allowed to stand in the rooms occupied by whooping-cough patients. He holds that the disease is mitigated and its duration lessened by this simple expedient.

To Disguise the Taste of Tincture of Iron. — Dr. Hager recommends that tincture of the sesquichloride of iron be mixed with simple syrup, and then with milk. This mixture will not affect the teeth, nor will the styptic taste be apparent.

Iodide of Ethyl in Dyspnœa. — Dr. Lawrence, in the *New York Medical Record*, considers this drug of great value in the treatment of spasmodic asthma and of all sorts of nervous dyspnœa. Let it first be given by inhalation from a handkerchief containing a few drops; then, when the patient has become a little accustomed to the odor, it may be inhaled directly from the bottle, continuing for about ten minutes three or more times a day.

SELECT FORMULÆ.

Camphor Ice. — Much that is called "camphor ice" is really a "camphor cream," though it may be an excellent article of the kind, except in appearance. To obtain a product which is of a semi-transparent or "icy" nature it is necessary to avoid the introduction of opaque bodies as well as of air bubbles. The peculiar effect of the latter may be well observed when melting two samples of vaseline, and allowing one of them to cool without stirring, while the other is briskly stirred. When both are cool the former will be semi-transparent, while the latter will be perfectly opaque, like a yellowish-white cerate. A correspondent of *New Remedies* gives the following formula: —

Spermaceti	2 parts.
Paraffine (melting not over 110° F.)	2 "
Castor-oil (colorless)	6½ "
Camphor	½ part.
Oil of rose (or other odor)	q. s.

Dissolve the camphor in the castor-oil with the aid of a gentle heat. Melt the spermaceti and paraffine, which must be perfectly clear and white, at as low a heat as possible; then add the castor-oil containing the camphor. When the mixture becomes somewhat cooler, but before any of it congeals, add the flavor and pour it through a white muslin strainer into suitable jars or forms, which must have been previously warmed. Allow it to cool slowly, without stirring, covering the jars well.

White Rose Toilet Water. — The following is commended as a formula for this preparation: —

Extract of rose pomade (third wash)	1 gallon.
Pure spirit	32 ounces.
Oil of rose	2 drachms.
Extract of violet (third wash)	5 ounces.
Extract of jasmin	2½ "
Extract of musk	2 "
Tincture of camphor	12 drops.
Oil of patchouly	1 drachm. M.

Napoleon's Laxative. — This preparation, prescribed for Napoleon by Corvisart, had the following composition: —

℞ Potass. borotartrat.	℥ss.
Antimon. et potas. tart.	gr. ½.
Sacchar.	℥ i.
Aquæ	℥ xv. M.

Dose, a wineglassful frequently, till it operates.

Disguising Cod-Liver Oil. — It has been found that tomato catsup, or walnut catsup, when mixed with cod-liver oil in the proportion of one part catsup to four of oil, and well shaken, renders the oil more palatable and easier of digestion. Another not unpalatable mixture is made as follows: —

Liebig's extract	½ an ounce.
Extract celery seeds	½ fluid drachm.
Vinegar	1 fluid ounce.
Water	2 fluid ounces.
Cod-liver oil	5 fluid ounces.

Dissolve the extract of beef in water, add the vinegar and oil, shake well together with the extract of celery.

Calamine Lotion. — The following is the formula prescribed by the late Dr. Tilbury Fox: —

Levigated calamine	40 grains.
Oxide of zinc	20 grains.
Glycerine	20 ℥
Rose water to	1 oz.

The main point is to get the white calamine and not the red. It is a very soothing application, and is a great favorite with the ladies who have flushed faces. It should be applied with a small, soft sponge and allowed to dry on, the excess of powder being lightly dusted off with an old pocket-handkerchief.

FACETIÆ.

A Cholera Prescription. — The following is from *Punch's* "Diary of a City Waiter:" "We took a long walk after this, and being preshus thirsty, we wanted summat to drink, but no Public House was open 'cause it was agin the law. We met a wery respectable Policeman and asked him what we should do, and he told us that some of the chemists in the neighborhood made up prescripshuns for thirsty soles that very few people would know from Brandy and Water, and all we had to do was to ring the bell and ask 'em to make up Dr. Walker's prescripshun for preventing of English Collery! As I don't want to get noboddy into trouble, I says no more, except this, that where there 's a will there 's ginerally someboddy over the way."

Mother Goose, M. D. — *Punch* is also responsible for the following: —

Says Aaron to Moses:
"I 've got trichinosis."
Says Moses to Aaron:
"T is because you pork fare on."

Senator Carpenter and the Colon. — The bright, mirthful soul of Carpenter was not overawed even by the shadow of death. The evening before he died he suffered excruciating pain, and in his agony wanted an explanation of the cause. "The pain is caused, senator," replied a physician, "by a stoppage of the colon." "Stoppage of the colon, eh?" and again the sense of humor overcame pain itself. "Well, then, of course *it is n't a full stop.*"

How Shall the Doctor get more Money? — The *New York Medical Record* says: "This is a question just now being agitated in medical journals. There are four ways of getting more money, namely, by stealing it, borrowing it, earning it, and marrying it. The code of ethics, Mosaic and medical, cuts off the first; various accidents, personal, geographical, etc., generally prevent the application of the last method; plan number three has long proved a failure. We advise the medical man who wants more money, therefore, by all means to borrow it, and pay up by treating the creditor."

Good Advice. — An aged miser feeling unwell, but grudging to pay a doctor's fee, sees with pleasure a medical gentleman with whom he is acquainted approaching him on the sidewalk.

"How do you do?" said the doctor, on meeting him.

"Well, I don't feel very well, doctor," replied the miser; "in fact, I am quite out of sorts. I have no appetite, my tongue is coated, I have pains in the back and in the head," and so on.

"Hum!" said the man of science, "that is pretty bad!"

"What would you advise me to do, doctor?" asked the avaricious one.

"To consult a doctor, by all means," replied the doctor, and walked away.

Perfumed Carbolic Acid is a solution of the acid in alcohol with oil of lemon added. The proportion is: carbolic acid, 1; oil of lemon, 3; alcohol, 100.

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Special Notices.

Denarcotized Opium with Hyponitrous Ether. — It has been found that many of the undesirable effects of opium are obviated by combining it, under certain conditions, with concentrated spirit of nitre. The aqueous infusion of opium has been thus combined by Messrs. Billings, Clapp & Co., Chemists, of this city, and it is fast becoming a favorite remedy with physicians. It can be had in bulk, or in one-ounce phials, by druggists and physicians.

The Crocker Reversible Filter. — We take pleasure in calling the attention of our readers to the advertisement of the Crocker Reversible, Self-Packing and Self-Cleansing Filter. Having carefully examined it we are able to pronounce this filter the best form in the market for general use. Unlike many forms of reversible filters, this one can be reversed without unscrewing it from the faucet, and is therefore less liable to be forgotten or neglected. The filtering material, which consists of finely ground animal charcoal, is contained in a sphere which revolves within the outer shell by the mere turning of a handle outside. The water, before entering the charcoal, is strained through very fine wire gauze, which removes all the coarser impurities, and on reversal these are quickly washed out by allowing a rapid stream of water to flow through the filter. When the charcoal has become saturated with impurities so that it no longer does its work, it can easily be replaced by a fresh charge furnished by the company at a trifling expense. Among the special features claimed for this filter is the manner of packing at the bottom, in combination with the manner of holding the ball containing the filtering material with a loose joint between it and the reversing handle, making it certain there will be no leakage around the ball, the pressure of water seating the ball firmly in its position, and hence it will always reverse as easily as when first put in use. The handle for reversing the ball is so made and packed that the pressure of water serves to make it tight, thus avoiding the annoyance of a leakage around it. The advantages of a reliable filter, not only in the household but in breweries, paper mills, starch and glucose factories, bleacheries, dye-houses, and laundries, as well as to all owners of steam boilers, are such that we are not surprised to hear that this filter is meeting with a very large sale already.

We have lately visited in person the house of Elmore & Richards, importers of Chemical Apparatus, etc., whose advertisement has long had a place in our columns. Their four large floors, at 4 Murray St., New York, are so closely packed with goods that it seems as though how to store an additional invoice would be a problem. The firm's intimate knowledge of the business, both from a scientific and commercial stand-point, their large, varied, and carefully selected stock, and their close personal attention to the minutest details enables them to fill their many orders with a promptness and precision which must be as gratifying to themselves as it is satisfactory to their customers.

Their handsomely illustrated Catalogue, which we may call scientific without doing any violence to that term, is a book of real value, and is duly appreciated by the many members of the profession who have received it.

The word Falcon, the name of Esterbrook's well known steel pen, is derived from *Falx*, a reaping hook, suggested by the shape of the Falcon's beak.

The Universal Bath. — If cleanliness is next to godliness, the English-speaking people must be nearer heaven than any other race. Except in England and America, bath-rooms in private houses are very rare. Englishmen, with their natural love of water, or abhorrence of filth, usually carry a tub with them when traveling on the continent. Americans have no excuse for being uncleanly when the Universal Bath, made by E. J. Knowlton, of Ann Arbor, Mich., can be used both at home and abroad. It is portable, convenient, and cleanly. See advertisement.

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AND
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Familiar Science

THE HOUSEKEEPERS' MILLENNIUM.

THE millennial epoch looked forward to and longed for by housekeepers, when heat for warming and cooking purposes will be brought into dwellings from some central source of supply, like gas and water, is apparently near at hand. Great activity has been manifested in this department of research and invention during the past twenty years, and many of the most serious obstacles have been overcome.

There are but three sources from which, at this stage of our knowledge, we can hope for a realization of our desires: (1) steam; (2) cheap fuel gas; (3) electricity. Let us briefly consider these heat sources, and examine some of the merits and demerits which are inseparably connected with each of them.

Steam heat is certainly unobjectionable, if the danger from explosion is removed, and if it can be brought under perfect control. These ends have long been reached in numerous household devices, and in any system of general supply, where boilers are absent from dwellings, no danger can be apprehended. Steam heat is mild, or can be made so, is easily regulated, and is associated with no deleterious gases whereby health is endangered. If a plentiful supply of steam, under moderate pressure, can be admitted to our dwellings from street mains, by the simple turning of a stop-cock, the great problem of independent house warming is solved, and satisfactorily so, unless a better method is offered us. There would seem to be a great many obstacles to be overcome in conveying steam long distances underground, and the greatest of all these is *condensation*. This difficulty, combined with the expansion of metals by heat and the liability of leakage, made the problem of any extended system of steam heating an unpromising one to inventors. Mr. Birdsill Holly, of Lockport, N. Y., claims, however, to have overcome them all, and in vindication of his claim points to seventeen or eighteen cities and towns where his system is in successful operation. We have given this matter some careful personal attention, and as the results of extended observation and experiment do not hesitate to say that Mr. Holly's claims are quite well founded. There are other inventors in the same line who may have reached even more practical results, but such are not known to us. Mr. Holly's device of expansion boxes connected with street pipes, his method of inclosing them in several coverings of insulating material, and finally in a perforated log of wood, are all very ingenious and practical, and render his system effective. Steam is thus conducted over an extent of four miles with a loss by radiation of only five per cent. Perhaps the most ingenious and wonderful of all his devices is one for measuring steam as it passes into dwellings, by which it may be known how much each consumer uses every day or month. It is well known that heat is measured by a standard unit, and it is possible to calculate the precise number of heat units carried by steam under any given pressure. The instrument alluded to measures accurately the number of heat units which pass into buildings, no matter what may be the pressure of steam. Thus each consumer pays for what heat he uses, and the heat may be economized just like gas or water.

It is claimed that steam heat can be supplied to buildings so as to cost actually less than the fuel used in the ordinary devices of stoves and furnaces. It probably is so, as the margin of saving is a broad one when steam is generated on a large scale and by the best evaporators.

The most powerful competitor which threatens steam heating is cheap fuel gas, and in this direction many scientific men and inventors are looking with confident expectations of success. Much has already been accomplished, and indeed it is claimed by several inventors that the problem is positively solved, and every desirable end reached. It is certain that most important obstacles have been in a measure overcome. What are known as the Strong and Lowe processes for making cheap non-illuminating gas for fuel embrace some principles which are worth considering, and give promise of success. There are others which have merits not to be overlooked. If fuel gas can be brought to our dwellings in pipes, delivered and measured in the same way as illuminating gas, and sold at prices which will compete with gross fuel, it will afford some advantages over steam. Although it is claimed that cooking can be done with steam, yet it is obvious that such claims cannot be sustained, as steam heat, even under high pressure, is far too low to conduct many of the processes of cooking. Stoves have been constructed in which steam is employed in connection with illuminating gas, but such devices do not quite satisfactorily meet the want.

Fuel gas can easily be made to meet every want of warming and cooking, and if the important questions of safety and economy are adjusted so as to quiet all apprehensions, the housekeepers' millennium is reached. No more dust, odors, bad gases, or angry, perspiring Bridgets, fresh from the hot kitchen range or dusty furnace, will appear to distract and burden housekeepers. Theoretically considered, the question of decomposing coal or water by heat so as to secure combustible products at cheap cost is one not well calculated to inspire hope. As a scientific problem it ranges itself with perpetual motion and kindred fallacies. Still, some things may be and have been done, even while science has shaken its head and doubted. A theory may be right, and a principle in physics is only an eternal law in nature which cannot be overturned, but may be changed, diverted, or combined so as to afford results quite unexpected. To decompose coal or water by heat would seem to involve cost which would correspond with the value of products obtained, or the heat units necessary to effect disassociation would only equal those supplied by the combustion of the products. The margin here must be looked for in the use of a form of fuel which is practically costless, fuel which cannot be utilized in any of the processes where heat is required.

In the Strong and Lowe process this end appears to be reached. By using, to a large extent, the waste dust of coal, and holding back from escape the waste product of partial combustion, carbonic oxide, a gaseous body is secured which has a very low cost. The claim is, that water is decomposed by the intense heat of a peculiar furnace, and its hydrogen forms an important part of the fuel gas. Carbonic oxide and hydrogen are the two mixed gases which form the cheap gaseous fuel. It is further claimed that the cost of production does not exceed twenty cents per one thousand cubic feet. This, if true, is satisfactory. Another inventor, Mackenzie, claims that he makes a fuel gas at a cost of only *three cents* a thousand feet. This gas has the not very serious disadvantage of being diluted with twenty-five per cent. of incombustible nitrogen. It may be a successful rival of the Strong and Lowe gas.

An objection to these fuel gases is made that they are to a considerable extent *inodorous*, and hence if they escape into dwellings no knowledge of their presence will be had. It cannot be said that any free gas from coals in living rooms is unobjectionable, and therefore this gas must have conferred upon it an odor which the most obtuse sense of smell cannot fail to detect. This can easily be done by mixing with it the vapor of naphtha or benzole. By this mixture the gas

can be made luminous, and may be made to do the work of lighting as well as warming.

Electrical force at the present time cannot be considered a hopeful rival of fuel gas or steam for heating purposes. The period may come, however, when it will be employed, but the prospect for its immediate use is not promising. From this brief discussion of the important topic of methods of improved warming and cooking, it will be seen that we are apparently on the threshold of the "good time" so long hoped for and anticipated, when the gross forms of fuel, as coal and wood, will no longer be required in our dwellings.

INSTINCT AS A GUIDE IN DIETETICS.

"INSTINCT," as Falstaff says, "is a great matter;" and it is curious and instructive to note how, in the absence of scientific knowledge, it has guided the human race in the selection and preparation of their food as well as such knowledge could have guided them, and in some cases even better. It has sometimes been right when science for the time was wrong, and the latter has eventually had to acknowledge the mistake it had made. It is not many years since the discovery was announced that the bran of wheat has a high nutritive value, and forthwith we were admonished by dietetic reformers that fine wheaten bread was not an economical food for the workingman. But that unscientific personage had learned to prefer the fine white loaf to the coarse brown one, and declined to be a convert to the new theory. His scientific brother naturally ascribed this to the force of habit or prejudice, and was very severe upon the obstinate wastefulness of the poor in throwing away an important part of their scanty fare. But, as we now know, the instinct that led the workingman to stick to the bread which the experience of many generations had taught him to prefer was right in its choice. The brown bread did, indeed, contain more nutriment than the white, but in the process of digestion the body got more nutriment from the latter than the former. The action of the bran particles on the alimentary canal caused the coarse bread to pass through it too rapidly, and the loss in this way was greater than the gain in the other. Improved processes now furnish us a fine flour in which the old waste of nutritious material is largely prevented; but even under the old methods of milling, the notion that "white bread is the poor man's food" was correct. It was brown bread that was the luxury, suited to the dyspeptic rich man, but too dear for the healthy and hard-working poor. Science was too hasty in its first inferences, and has since learned that the digestibility of food and its aptitude for assimilation must be considered, and not merely its chemical composition.

Equally based upon sound principles is the workingman's liking for animal food. Scientific men have demonstrated that vegetable food contains essentially the same nutritive matter, while it is a good deal cheaper. They have explained that the fibrine of flesh has a very close analogy to the gluten of wheat, and is fitted to serve the same purpose in nourishing the body, and so with animal fats and vegetable oils, and the other leading constituents of the two kinds of diet; but the poor man nevertheless persists in spending as much of his hard earnings for meat as he can possibly afford. If he cannot have the coveted food every day, he will have it when he can, if only once a week. Recent German investigations prove that this preference for flesh has somewhat the same economical arguments in its favor as that for the fine bread in comparison with the coarse. It has long been known that, as a general rule, flesh is easier of digestion, and is therefore more perfectly assimilated, than bread and other vegetable food. We must consider not merely how much nutriment each puts into the body, but how much of it remains there and how much is rejected as waste. Good authorities have stated that, if equal nutritive quantities of each are eaten, the loss from the vegetable is twice as much as from the animal food; but it would seem from these recent experiments and analyses that the waste of nutriment is often much greater in the case of vegetables.

Professor Hofmann gave to a servant of his 1000 grams of potatoes, 207 grams of lentils, and 40 grams of bread. On an average of six days it was found that 356 grams of the solid matter were digested, 116 remaining undigested; 38.7 of nitrogenous matter had been digested, 44.4 undigested; 263.8 of starch digested, and 28.2 not. It would here appear that not even one half of the total albuminous matter of this vegetable diet had been digested.

The same man was then given 390 grams of lean beef daily, 126 of pure fat, and 40 grams of flour. The result was that 221.8 grams of solid matter were digested, 33.6 undigested; 73 of albuminous matter were digested, and 16.9 undigested; 121.1 of fat were digested, and 4.9 undigested. Here the animal food was shown to be much more digestible than the vegetable.

Dr. C. Meineret, in a recent treatise, gives the loss of nitrogen in solid excreta expressed in percentages of the total nitrogen contained in various substances. In meat that loss he found to be only 2.6; in eggs, 2.6; in milk and cheese together, 2.9 to 4.9; in milk alone, 7; in macaroni, 17.1; in peas, 27.8; in black bread, 32; in potatoes, 32; in carrots, 39; in lentils, potatoes, and bread, taken together, 47; in lentils, 40.2; in celery, cabbage, and carrots, 31; in Horsford-Liebig's bread, 32.40; in rye bread, 22.2; in very black (or brown) bread, 42.3; in white wheaten bread, 19.9; in mixed food with meat (fourteen days), 18 to 12. White bread, it will be noticed, is far more digestible than brown bread.

Rubner took 1172 and 1435 grams of meat daily (more than 2 lbs.), and yet all the albuminous matter except 2.5 per cent. was digested; and when 21 eggs were taken daily, 2.9 per cent. alone of the albumen was undigested. Flügge took daily one liter of milk, 500 grams of meat, 150 grams of wheaten bread, and 68 grams of butter, and found that 94 per cent. of the nitrogen was absorbed, and 95 per cent. of the fat. When he took a diet chiefly vegetable, he had only 85.3 per cent. of the nitrogen absorbed, and 88.7 per cent. of the fat.

The results of these experiments by independent investigators evidently agree in proving that a much larger fraction of nutriment is utilized in the case of the animal than in that of the vegetable food. They go far towards knocking away the very foundations of vegetarianism by showing that our digestive apparatus is better adapted to deal with the former than the latter; and they strongly confirm the teachings of an instinct of the race on this subject.

GEOLOGY OF FLORIDA.

THERE is probably no State east of the Mississippi which is so much of a *terra incognita* as the one which contains the oldest city on the continent, — Florida. As a health resort for invalids in winter, as the home of malaria and a country of impenetrable swamps, and as a hiding-place for a few remaining red men, Florida alone is noted. Unlike its neighboring States, it has neither state chemist nor state geologist. We are therefore indebted to Prof. E. A. Smith, of Alabama, for a connected statement of the past geological history of Florida. From an interesting paper in the *American Journal of Science*, accompanied with a geological map, we abstract the following conclusions: —

(1.) Since no rocks have been found in Florida older than the Vicksburg limestone, it follows that, until the end of the Eocene period, this part of our country had not yet been added to the firm land of the continent, but was still submerged.

(2.) During the period of disturbance which followed the deposition of the Vicksburg limestone, Florida was elevated nearly to its present height above the sea-level, which elevation was maintained without material interruption until the Champlain period.

(3.) In this upward movement the axis of elevation did not coincide with the present main dividing ridge of the peninsula, but lay considerably to the westward, probably occupying the position very nearly of the western coast of to-day.

(4.) After the Miocene (or possibly the Pliocene) period, there was again an elevation of Florida, as is shown by the presence of a Miocene limestone on the eastern slope of the peninsula, some distance (not less than thirty feet) above present sea-level.

(5.) We have evidence in the distribution of the beds of the Champlain period (stratified drift, or orange sand) that Florida and parts of the adjacent States were during this time submerged sufficiently to allow the deposition over them of a mass of pebbles, sand, and clay, varying in thickness from a few feet to two hundred.

From the peculiar mode of stratification of most of these beds, it is concluded, with reason, that they were sediments from rapidly-flowing, ever-varying currents. In the northern part of the State, the beds of yellow and red loam lie directly upon the stratified drift. These beds of loam are devoid of stratified structure as well as of fossils, and were probably deposited from slowly running or nearly stagnant waters.

(6.) Following the submergence during the Champlain period was a reëlevation, which brought up the peninsula with approximately its present configuration.

Although Florida was at one time twice as wide as now, Professor Smith evidently does not accept the theory that the Gulf of Mexico was once a fresh or brackish water-basin, isolated by some means from the Atlantic.

PHOTOGRAPHING BY TELEGRAPH.

It is now some time since a method was devised for transmitting copies of drawings, autographs, or portraits by telegraph. Since the introduction of selenium into telegraphy it seems probable that we shall some day be able to connect the photographic camera directly with a telegraph wire, through the medium of a strip of selenium, and reproduce the image formed in the camera at the other end of the wire. Selenium telegraphy is yet in its infancy, Graham Bell's photophone being the first practical application of it. At a recent meeting of the London Physical Society (reported in the *Chemical News*) Mr. Shelford Bidwell read a paper on the "Telegraphic Transmission of Pictures of Natural Objects." He exhibited to the society a telephotograph for this purpose. The transmitter consists of a brass cylinder mounted on a screw spindle, which carries the cylinder laterally 1-64th inch at each revolution. A pin-hole in the middle of the cylinder allows light to fall upon a selenium cell placed behind it within the hollow cylinder. The cell is connected in circuit with a battery and the line. The image to be transmitted is focussed upon the cylinder of the transmitter. On rotating the cylinder the pin-hole, in the course of its spiral path, covers successively every point of the focussed picture. The amount of light falling upon the selenium will be proportional to the illumination of that particular spot of the image which is for the time being occupied by the pin-hole, and the intensity of the current will depend upon this illumination. The receiver consists of a similar metal cylinder, mounted so as to rotate synchronously with the first, and having a platinum point pressing upon a sheet of chemically prepared paper wrapped around the cylinder. The platinum point, which is connected with the line, describes the same path over the prepared paper that the pin-hole did over the projected image. By a suitable arrangement of resistance coils the strength of the current is so regulated that when no light falls upon the selenium, the platinum point makes an impression on the sensitive paper, but when the selenium is exposed to full sunlight no mark is made; a feeble impression is left by shadows and half tones. These variations will produce a picture which, if the instrument were perfect, would be a counterpart of that projected upon the transmitter. The operation is necessarily slow, and adapted only to inanimate objects, but the results are scarcely more crude and imperfect than the earliest pictures made by the photographic art; and while the telephotography does not promise much, its possibilities are considerable.

IS THERE ANY OZONE IN THE ATMOSPHERE?

Several scientists have busied themselves with the determination of the quantity of ozone present in the atmosphere at different times and in different places. Attempts have been made to show the effect of atmospheric ozone upon the human system, both as a cause and cure for disease. A strong blow to all these fine-spun theories is found in a paper read before the Paris Chemical Society, by M. Schœne, in which he states that we do not, up to the present time, possess any clear and decisive proof of the presence of ozone in the atmosphere. In fact, says he, all the reagents by means of which its existence has been sought to be proved are equally acted upon by peroxide of hydrogen, the presence of which in the atmosphere has been established by the author. The ozonometers of Schönbein and Houzeau, in which iodide of potassium and starch are used, cannot serve to determine the variations in the quantity of atmospheric ozone or peroxide of hydrogen, since they are greatly affected by the quantity of moisture in the atmosphere. The author makes use of paper impregnated with a solution of thallium hydrate, which is not influenced by the variations in the hygrometric state of the atmosphere, and does not undergo any change after its exposure to the air, provided it is preserved with a little care.

SCIENTIFIC BREVITIES.

Exhalation of Carbonic Acid. — Recent experiments of Grehant prove that the quantity of this gas exhaled by any one individual of the animal species is about constant. Fifty liters of air passed through the lungs of a dog weighing 9 kilos yielded 2.747 grams of carbonic acid. Eight days later the same experiment yielded 2.810 grams. In man, this volume of air circulating through the lungs receives 3.333 grams of that gas. Irritations and inflammations of the respiratory mucous membrane decrease the quantity of carbonic acid exhaled, which then accumulates in the blood.

Magnetic Property of Meteoric Iron. — J. Lawrence Smith, in examining meteoric iron from Brazil, found that small fragments, weighing 0.1 to 0.2 gram were very weakly affected by a magnet; but on being flattened on a piece of steel with a steel hammer they became very sensitive to it. What is still more surprising is that when heated red-hot the particles were made to be still more easily attracted than by flattening. The meteoric iron contained 34 per cent. of nickel and 66 of iron.

Magic Mirrors. — Laurent has found that any ordinary good silvered glass mirror of any thickness may be rendered magical by heat. A simple way of doing this is to heat a brass tube and apply the end of it to the silvered face. If the surface of the mirror is opposite a screen, the section of the tube is reproduced in white; if it is turned away from the screen, the image (which is seen only after the tube is removed) is dark. A cold tube may be used with a hot mirror.

Effects of Great Cold upon Magnetism. — It has long been known that heat possesses the power of destroying magnetism in metals, cobalt excepted. An investigation of the effect of cold upon the magnetic condition of steel is now in progress in the physical laboratory of Harvard University. The preliminary experiments show that a bar of steel, magnetized at 20° C. to saturation, when subjected to a temperature of — 60° C. lost two thirds of its magnetism. After twenty-four hours' exposure to the temperature at which it had been magnetized, its magnetic condition was fifty per cent. of its original state.

The Interior Sea in Africa. — We have several times referred to the French idea, that if a canal were cut from the Mediterranean to the deserts of Tunis and Algeria, the latter could be converted into navigable seas. Many persons, as we have stated, believe that the evaporation in that latitude would be so rapid that the sea would soon become saturated with salt, and ultimately merely a bed of salt. Commandant Roudaire, who was commissioned by the French Academy to examine the subject, has finished his investigations. His conclusions are entirely favorable to the project, which would lead to the establishment of an interior sea 250 miles long, and nearly 1000 miles in circumference.

Absorption Spectrum of Ozone. — Carefully conducted experiments recently made by W. N. Hartley, of Dublin, show that when light which has passed through oxygen containing $\frac{1}{5000}$ part of ozone is subjected to spectroscopic examination, an absorption band appears in the ultra-violet portion of the spectrum. The mean wave length intercepted by ozone is 256 millionths of a millimeter.

Spectroscopic Study of the Sun. — Thollon is carefully studying the sun's surface at the Paris observatory. He describes a number of interesting hydrogen explosions, resembling gigantic displays of fireworks, and sometimes remaining visible for two days. One of them was more than 200,000 miles in height, and explosions of from 25,000 to 50,000 miles in height are quite common.

The First Mahogany in England. — Mahogany was introduced into England by Sir Walter Raleigh, who brought the trunk of a tree of that wood to Queen Elizabeth from Brazil. It was made into various articles, which she presented to her courtiers. For herself a small workbox was constructed, which is now in the Tower of London in a perfect state of preservation.

Fermentation at High Temperatures. — Boussingault states that when a large quantity of yeast is added to wines rich in sugar, fermentation proceeds rapidly at a boiling temperature, provided the pressure is considerably diminished.

SANITARY NOTES

Corrosion of Lead Pipes by Lime. — The following, from the *American Architect*, is well worth noting: "A scientific investigation has recently been made into a matter which many plumbers and others have had presented to them in various ways, but which has been hitherto unexplained. It seems that in Germany the underground telegraph wires are often carried through lead pipes, and in renewing some wires in one of the large cities the pipes were found to be corroded irregularly, the points of greatest corrosion being afterwards ascertained to coincide with certain places where the cable passed in contact with lime mortar or cement. Taking this circumstance as a point of departure, Dr. Rossel has studied the action of various substances upon lead, and finds that, while carbonated lime exercises no action on the metal, the hydrate, as it exists in mortar, attacks it with considerable energy, and if moisture is present a sheet one thirtieth of an inch thick may be eaten through in a year. The lead is converted into a basic carbonate, which flakes away, leaving holes and indentations. This corresponds perfectly with the phenomenon, with which many plumbers are familiar, of the corrosion which takes place in traps or lead-lined tanks into which plastering mortar is allowed to fall. We have in mind one case where a cistern of considerable size, lined with lead, and exposed to the dropping of particles of lime from the plastering overhead, was eaten through year after year, to the great perplexity of the owner and his plumber, who could find no explanation in treatises on chemistry for such action."

Detection of Arsenic in Wall-Papers. — Mr. Bernard Roth, F. R. C. S., in the *British Medical Journal*, recommends the following as the most simple test for arsenic in wall-papers, first proposed, he says, by Professor Siebold: A small test-tube is filled to a depth of 1 to 1½ inch with a mixture of equal parts of pure hydrochloric acid and water; a piece of pure zinc of the size of a pea and a rolled-up narrow strip of the paper to be tested, are now added. While the gas is escaping, a loose plug of cotton-wool (about three quarters of an inch in depth), previously dipped in a solution of acetate of

lead, is quickly pushed down the test-tube for one or two inches; the mouth of the test-tube is then covered with a piece of white blotting-paper moistened with a solution of silver nitrate. If a round dark or black stain appear on the blotting-paper, corresponding to the top of the test-tube, the wall-paper contains arsenic. The experiment is made more certain by previously going through the same experiment, but without the presence of the wall-paper, when no, or only a very slight, darkening is produced if the materials employed contain no, or only a trace of, arsenic.

Sunlight for Children. — The *London Medical Times and Gazette* remarks: "Sir James Paget, in his address at Cambridge last August, suggested as a good subject for a scientific thesis the analogies between a green rose and a rickety child. In our opinion this is the direction in which inquiries must be made if we would solve the difficulties of this really important social question. Bearing in mind the effect of sunlight upon the nutrition and growth of plants, let us ask ourselves whether its privation may not be a most powerful factor in the growth and development of infants. Is it not very probable that an infant under the influence of air and ample sunlight may be able to develop and grow on a diet which, without sunlight, would be insufficient?"

FOR EXPERIMENTERS.

A Lecture-Room Aurora. — Mr. Ackroyd employs the following device for giving to an audience a vivid idea of an aurora. He first paints a representation of it with Balmain's luminous paint and hangs it up in the lecture-room covered with black tissue paper. At the appointed time the lights are lowered, the tissue paper is withdrawn, and magnesium wire burnt in front of the painting. A screen may be held between the wire and the audience to prevent their being blinded by the dazzling magnesium light. When the wire stops burning the aurora will be seen quite faithfully represented.

An Illustration of Amœboid Movements. — The curious movements of the lowest forms of life are illustrated by Dr. Haycraft with a simple mechanical contrivance, which will be found useful in the class-room. He takes an india-rubber ball, perforated with a number of small holes, fills it with colored albumen (white of egg), and immerses it in a solution of sugar of about the same density as the albumen. A gentle pressure applied to the ball forces out the albumen in finger-like processes, which are retracted when the pressure is relaxed, thus clearly imitating the extension and retraction of the amœboid processes of protoplasm familiar to all microscopists.

A Magnetic Thermoscope. — Sir William Thompson has devised a new form of thermoscope, based on the fact that a magnet loses strength as it is warmed and recovers it on cooling. Two tiny magnetic needles are suspended near two other similar magnets, called deflectors. The deflectors alter the position of the suspended couple whenever a change of temperature occurs. This deflection is rendered evident by the reflection of a ray of light from a mirror attached to one of the needles.

HOUSEHOLD HINTS.

How to Cook Asparagus. — The *Caterer* says: "The proper method is rarely followed. Asparagus of the stouter sort, always when of the 'giant' variety, should be cut of exactly equal lengths, and boiled, standing heads upward, in a deep saucepan. Nearly two inches of the heads should be out of the water, — the steam sufficing to cook them, as they form the tenderest part of the plant, while the hard stalky part is rendered soft and succulent by the longer boiling which this plan permits. Instead of the orthodox twenty minutes allotted to average asparagus lying horizontally, which half cooks the stalk and overcooks the head, diminishing its flavor and consistence, a period of thirty or forty minutes, on the plan recommended, will render fully a third more of the stalk delicious, while the head will be cooked by the steam alone."

Pine Cones for Kindling. — On the continent of Europe cones for kindling fires are used almost universally. When dry they are readily ignited with a match, and they are free from dust and insects. Two of them commonly are enough to start a fire of dry wood, and several will start a coal fire without other kindling. In view of these facts the suggestion is made that possibly a large and profitable business might be done in gathering cones in our pine growing regions and selling them in the large cities.

To Remove Old Paint. — Take sal soda, 2 lbs.; lime, ¼ lb.; hot water, 1 gallon: stir all together and apply to old paint while warm. The mixture will soon loosen the paint so that you can easily remove it.

How to Make Cisterns and Tanks Water-Tight. — Paint thickly on the inside with a mixture of 8 parts of melted glue, and 4 parts of linseed oil, boiled with litharge. In 48 hours after application it will have hardened so that the cistern or tank can be filled with water.

Tincture of Insect Powder. — A concentrated tincture of insect powder is highly recommended as an insecticide by Finzelberg, who prepares it by digesting one part of Persian insect powder in ten parts absolute alcohol, and claims that, in order to prove efficacious, it should be scattered by means of an ordinary perfumery atomizer. When thus used in closed rooms, all flies soon drop dead; while scattering it over linen, etc., acts as a protection against fleas and other vermin.

Practical Chemistry and the Arts.

THE SOCIETY OF ARTS.

At the meeting of March 24th, Prof. Wm. B. Rodgers gave an interesting description of the luminous paint, now beginning to attract so much attention. He detailed the first discovery of this property of phosphorescence by the shoemaker of Bologna, nearly 300 years ago; and how Canton, in 1768, found that oyster shells heated with sulphur acquired the same property. About 1830, Edmond Becquerel took up the scientific investigation of the subject, and found that many other substances beside the sulphides of barium and calcium possess the property of phosphorescence, but for a much shorter time. Nearly all organic bodies retain this property for a fraction of a second. The yellow diamond, after being exposed to light, continues to glow for a very short time. To examine these bodies, Becquerel employed two revolving discs attached to the same axis, with openings not opposite each other, so that a ray of light entering one was cut off by the other. The substance under examination was placed between them. The sunlight fell upon it through the openings in one disc, and the observer watched it through those of the other. If it retained its luminosity long enough, the observer would be able to see it when an opening in his disc came opposite, and with a rotation of 1000 revolutions per second, persistence of vision enabled him to see it continuously. It was found, by this means, that green canary glass continued to glow for $\frac{1}{3000}$ of a second.

Balmain was engaged with Becquerel in the study of phosphorescence, and afterwards applied it to the production of a luminous paint. Unfortunately, Balmain died before the completion of his invention. Although much progress has been made, it still requires many improvements to make it practical. It is in good hands, however, and we may expect to hear from it soon on a large scale. Professor Rodgers then exhibited several plates of glass covered with the paint, and rendered them luminous by burning magnesium wire. Portions of the plate protected by red or yellow glass remained non-luminous. He then spoke of some of its uses, such as painting divers' suits, the holds of ships, railway cars, watch-faces, street signs, and house numbers.

At the meeting of April 13th, Prof. John D. Runkle delivered a lecture before the Society, on Technical and Industrial Education Abroad. Photographs of the buildings, with ground plans and schemes of lectures, were in many cases exhibited. The paper, which is too long for our columns, was listened to with marked interest, and gave rise, at the close, to an animated discussion as to the best form of technical education, and its applicability to this State and city.

NEW THINGS IN THE ARTS.

Improvement in Silvering Mirrors. — Our readers are aware that the old method of "silvering" mirror plates by covering them with an amalgam made of tin and mercury has been to a great extent superseded by the process of depositing a coating of real silver upon the glass, the metal being thrown down in a smooth film by adding oil of cloves or other organic substances to a solution of ammonio-nitrate of silver, retained upon the surface of the plate by a raised rim of wax or similar material. These silvered plates, although cheaper than those made by the old process, are inferior in lustre, the latter having the "black" color which silversmiths regard as indicating perfection of polish, while the others are yellowish in cast; and a process has long been sought by which the brilliancy of the mercurial coating could be imparted to the cheap and durable silver film. This has at last been accomplished by chemical reaction. After the silver plating is complete, the film is flooded with a weak, aqueous solution of the double cyanide of mercury and potassium; slow decomposition takes place, and the mercury is precipitated, which immediately amalgamates with the silver film. The result is said to be very satisfactory, the amalgam of silver being quite as brilliant as that of tin, and less subject to change; while the new process has the advantage of being readily applicable to the largest plates, which by the ancient method of manipulation could be treated only with great difficulty, if at all.

New Pigment. — By the addition of ferrocyanide of potassium to the intensely blue ammoniacal solution of sulphate of copper, M. Guyard has obtained a precipitate which, when dried at 338° F., forms a fine violet-colored pigment. If heated to 392°, it changes to blue, and at 480° to a dull green. Concentrated solutions of salt of tin turn it to a vinous red. It will probably find use in coloring paper, if not in calico printing, being more durable than the aniline and other coal-tar colors.

New Varnish. — Fr. Theis, of Bissendorf, prepares a varnish consisting of 100 parts of resin, 20 parts of crystallized carbonate of soda, and 50 parts of water, by heating these substances together and mixing them with a solution of 24 parts of strong liquor ammoniæ in 250 parts of water. With the mass thus obtained the pigments are levigated without the addition of linseed oil or turpentine; the paint dries readily without the aid of a drier, and looks very well, especially when varnished. The paint keeps well, even under water, and becomes very hard. The cost is said to be about one third that of ordinary oil paints.

NEW LUBRICANTS. — K. Drechsler mixes graphite with the white or yolk of eggs, dries the mixture, pulverizes it, and scatters it upon the parts of machinery that move slowly. G. Lieckfeld mixes graphite with soluble glass, so as to make a thick paste. The mass is spread upon worn surfaces, where it soon hardens, and can be filed or turned, so as to restore the machinery to its original perfection.

SOLUBLE STARCH. — Zulkowski has discovered an interesting property of starch, that of dissolving in glycerine, and being then transformed into soluble starch. On dissolving 60 grams of starch in one kilo. of glycerine, the grains of starch swell up at about 130° C., and the mass thickens more and more. From this point on it liquefies, and at 170° it is perfectly fluid. At 190° nearly all the starch is converted into the soluble form. By pouring into water and filtering, the unchanged and insoluble starch can be separated. The same property was also noticed previously by Kabsch.

ARTIFICIAL DIAMONDS. — It will be remembered that the artificial production of the diamond made last year by a Scotch chemist looked very much as though small diamonds had been fractured. None of the specimens were perfect. All of them were fragments. A step in advance has been made, however. Dr. Marsden, according to *Design and Work*, has lately been able to effect the crystallization of carbon in the cubical form. Possessors of the most valuable of natural gems need not be alarmed as yet: Dr. Marsden says his crystals are so small that they are of no commercial value whatever. The fact that a perfect diamond can be produced, no matter how small, is a notable event, and when the paper describing the process by which the end was attained is published it will command general attention.

IMPROVEMENT IN PEELING PEACHES. — The work of peeling peaches in peach-drying establishments has been simplified by the following process: A crate filled with fruit is dropped into a vat containing hot lye, and there shaken. It is then removed to a tank of pure cold water, and the lye is washed away. The skins of the fruits by this process become so separated from the pulp that they are drawn off with one move of the hand. This saves much time, labor, and expense. The new process causes the fruit to dry more readily, and a very little loss in weight ensues.

NOTES ON ANALYTICAL CHEMISTRY.

SEPARATION OF COPPER AND ZINC. — Larsen separates these two metals quantitatively by precipitating the former hot with sulphydric acid, and washing it with hot water, which contains both sulphydric and hydrochloric acids. Unless the wash water contains hydrochloric acid, the zinc is carried down with the copper.

SEPARATION OF ALUMINA FROM IRON. — Donath dissolves the iron, which must be in the protoxide form, and the alumina in excess of potassium cyanide, and then precipitates the alumina by means of acetic acid.

ESTIMATION OF ETHYL NITRITE IN SPIRIT OF NITROUS ETHER. — E. Kellstrom, of Stockholm, suggests the following method: A given quantity of the spirits of nitrous ether is shaken in a strong flask with alcoholic potash, and digested on the water-bath, to decompose completely the ethyl nitrite. The fluid, which now contains potassium nitrite, is evaporated on the water-bath, the residue dissolved in water, filtered, diluted, acidified with sulphuric acid, and titrated with potassium permanganate. Samples from Stockholm pharmacies were found to contain from .2 to 2.5 per cent. of ethyl nitrite, while one manufactured in the Stockholm Pharmaceutical Institute contained 3 per cent.

SEPARATION OF SILVER FROM LEAD. — Donath adds 4–5 c. c. pure glycerine to the solution of these metals, then an excess of ammonia and 10 or 15 c. c. concentrated sodic or potassic hydrate. When clear, boil for 4 or 5 minutes. The precipitated silver is washed with hot water and dilute hot acetic acid. The lead can be determined in the filtrate after acidifying by means of sulphydric acid.

GAS ANALYSIS. — Fileti recommends the use of plaster-of-Paris balls, instead of coke, for introducing absorbent substances into the gas. Ludwig's method of oxidizing carbonic oxide, by means of chromic acid, in the presence of hydrogen he rejects as useless.

CHARACTERISTIC COLOR TESTS FOR THE SULPHYDRATES. — Claessen has found that a solution of ferric chloride gives characteristic colors with the sulphydrates, but none with sulphides and bisulphides. The sulphydrates of the alkalies and alkaline earths give a *green* color with ferric chloride. Sulphocyanides and hyposulphites yield a dark red color. The sulphydrate of methyl, ethyl, amyl, benzol, and toluol, the disulphydrate of toluol and thiacetic acid produce a dark reddish-brown color; thioglycolic, as well as thiolactic acid, a dark reddish violet. Before adding the ferric solution, which must be very dilute, a little ammonia is added to the solution that is to be tested. The colors disappear after a short time.

CHEMICAL JOTTINGS.

ATOMIC WEIGHT OF ALUMINIUM. — Prof. J. W. Mallet has been engaged for the past three years in a most careful examination of the atomic weight of aluminium. Three methods were employed, namely: (1) Ignition of the ammonia alum; (2) precipitation of the bromine in aluminium bromide by silver; and (3) evolution of hydrogen by the action of metallic aluminium upon sodium hydrate. The mean of thirty experiments gave Al=27.032; or, excluding one determination which he thinks less reliable than the others, we have Al=27.02. Professor Mallet calls attention to the fact that there are ten elements whose atomic weights approximate to integers within less than one tenth of a unit.

THE GLOW-LAMP. — It is well known that when a piece of hot platinum foil or wire is suspended over a vessel containing ether it will continue to glow indefinitely, owing to a slow oxidation of the ether in contact with its surface. A peculiarly disagreeable odor is produced; but the nature of the substance formed was, until recently, unknown. L. Legler, who is engaged in studying it, writes to the Berlin *Berichte* that it is a definite chemical compound, soluble in water, and that he has obtained it in beautiful needle-shaped crystals an inch long. It is easily converted into gas, and is, under certain circumstances, explosive. Its reaction with salts and alkalies is very interesting. He has not yet published its composition or constitution.

TETRACHROMATE OF POTASSIUM. — Wyroboff has prepared a tetrachromate of potassium, $K_2O(CrO_3)_4$ in crystals large enough to measure by treating the bichromate with concentrated nitric acid, spec. grav. 1.41. Nitrate of potassium, which is formed at the same time, can be separated by crystallization. Tetrachromate of ammonium is obtained by an analogous process, but only in very small plates. Both contain a small quantity of nitric acid inclosed within the crystals.

PREPARATION OF SULPHURYLCHLORIDE. — Schulze has found that this substance may be prepared very readily by passing chlorine gas into a fluid mixture of camphor and sulphurous acid. By alternately passing in sulphurous acid and chlorine, keeping the mixture cold, an almost unlimited quantity can be obtained.

A GLUCOSIDE IN IVY. — Vernet has obtained from the alcoholic extract of common ivy leaves a glucoside which crystallizes in silky needles, melts at 233° C., is neutral to litmus, and turns the plane of polarization to the left.

FREEZING-POINT FOR ALCOHOLIC LIQUORS. — Raoult's determinations are as follows: —

	Per cent. of Alcohol.	Freezing-Point.
Cider	4.8	—2.0° C
Beer	6.3	—2.8
Red wine	6.8	—2 7
White wine	7.0	—3.0
Red Bordeaux	11.8	—5.2
Red Burgundy	13.1	—5.7
Marsala	20.7	—10.7

PRACTICAL RECIPES.

TO PREVENT "SALTPETRING" IN BRICKWORK. — Our readers are familiar with the disfigurement of brickwork by the white saline substance that "comes out" upon it, and may be glad to know how this can be prevented or removed. The *American Architect*, in reply to a query on the subject, says: The "saltpetring" of brickwork can generally be prevented by adding oil to the mortar, at the rate of a gallon to the cask of lime. If cement is used in the mortar, an additional gallon of oil must be allowed for each cask of cement. Linseed oil is generally employed, but any kind which does not contain salt will answer. The incrustation, once formed, can be removed with hot water, or by the muriatic acid generally used for cleaning down brickwork, but it will reappear again by exudation from the interior of the wall, and usually leaves a permanent black or brown stain.

HARDENING SMALL TOOLS. — It is said that the engravers and watchmakers of Germany harden their tools in sealing-wax. The tool is heated to whiteness and plunged into the wax, withdrawn after an instant and plunged in again, the process being repeated until the steel is too cold to enter the wax. The steel is said to become, after this process, almost as hard as the diamond, and when touched with a little oil or turpentine the tools are excellent for engraving, and also for piercing the hardest metals.

MUCILAGE FOR ADHESIVE LABELS. — Dissolve by aid of heat, 2 oz. of dextrine in a mixture of 1 oz. of acetic acid and 5 oz. of water. When solution is effected and the mucilage has cooled, add 1 oz. of alcohol.

WATERPROOF BRANDING INK. — Shellac, 2 oz.; borax, 2 oz.; water, 25 oz.; gum arabic, 2 oz.; lampblack, sufficient. Boil the borax and shellac in water till they are dissolved, and withdraw from the fire. When the solution has become cold, complete twenty-five ounces with water, and add lampblack enough to bring the preparation to a suitable consistence. When it is to be used with a stencil it must be made thicker than when it is to be applied with a marking brush. The above gives a black ink. For red ink, substitute Venetian red for lampblack; for blue, ultramarine; and for green, a mixture of ultramarine and chrome yellow.

FREEING BENZINE FROM OFFENSIVE ODOR. — According to Mr. Fairthorne, benzine may be freed from all offensive odor by shaking it up well with quicklime, about three ounces to the gallon.

CEMENT FOR RUBBER. — Powdered shellac is softened in ten times its weight of strong water of ammonia, which becomes fluid after keeping some little time without the use of hot water. In three or four weeks the mixture is perfectly liquid. When applied it softens the rubber, which hardens again as the ammonia evaporates.

A CEMENT FOR MENDING PLASTER CASTS. — This is made by dissolving small fragments of celluloid in ether, and decanting the liquid after standing some time. The softened cellulose which is left is recommended by a French journal as a cement

for joining broken models or castings in plaster. It dries rapidly, and will not dissolve in water, but must be prepared fresh for each operation.

INK FOR RUBBER STAMPS. — Take of Hofmann's violet 1 oz., hot water 5 oz., glycerine 1 oz., and treacle (molasses) ½ oz. The latter substance is said to secure a brighter impression, and greater duration of the ink.

STAINING WOOD GREEN. — To half a pound of the best verdigris add 1 oz. of indigo; boil in 6 pints of vinegar. Allow the veneers to simmer till the color has penetrated.

Agriculture.

SOLUBLE PACIFIC GUANO.

A COMPOUND fertilizer with the above name is made by parties, we think, at Wood's Holl, and has been extensively advertised in this section during the past spring. The name led us to suppose it was genuine Pacific guano, acted upon by sulphuric acid, so as to render the phosphates soluble and fix the volatile carbonate of ammonia in the form of a sulphate, but upon investigation we learned that this was an error. The circulars issued by the makers failed to afford any clue to the composition of the mixture, and this circumstance, together with some others not clearly explained, led us to make analysis of the fertilizer. The specimen subjected to analysis, was taken from a package in the hands of dealers, Messrs. Hanscom Brothers, Haverhill, Mass. The specimen gave the following results: —

100 parts of the substance contained, of

Soluble phosphoric acid	6.60 per cent.
Reverted phosphoric acid	3.50 " "
Insoluble phosphoric acid	2.40 " "
Ammonia	3.48 " "
Equal to nitrogen	2.87 " "
Moisture	11.07 " "

The phosphoric acid was apparently derived from the South Carolina rock phosphate, and the ammonia from dried fish. The value of this fertilizer, estimating the value of the plant food constituents at the prices established at various experiment stations in the country, is as follows: —

One ton of 2000 lbs. would contain, of

Soluble phosphoric acid	132 lbs.	at	12 cts. per lb.	$16.84
Reverted " "	70 lbs.	at	8 cts. per lb.	5.60
Insoluble " "	48 lbs.	at	3 cts. per lb.	1.44
Nitrogen	57 lbs.	at	20 cts. per lb.	11.40
				$35.28

A small amount of potash present was not estimated accurately. This might increase the value to $37 per ton.

The cost and market value of the valuable constituents of fertilizers vary, being influenced by the source and availability of the substances: for instance, nitrogen in the nitrates of soda and potassa is worth 26 cents per pound; in ammonia salts, 22 cents; in steamed bone, dried blood, and fish guano, 20 cents; in fine bone, horn, and wool dust, 15 cents; in *coarse* bone, only 12 cents. We have estimated the nitrogen in this mixture as worth 20 cents, as it evidently comes from fish pomace.

The retail price of the fertilizer is $45 the ton. The analysis shows that the statement of composition, as placed upon the bags, is not far from correct. The amount of reverted phosphate is larger, but this is of no special importance, and might be expected. The nitrogen is higher than the minimum, and not as high as the maximum, statement. We shall look into the fertilizer business as occasion offers, and make analyses of some of the popular brands, for the benefit of our readers. The law affords some protection, but the trade is not yet supplied with such goods as the interests of agriculture demand.

BURNING CORN.

IT has long been known that corn on the ear has been used as fuel in many parts of the West, and that in some sections it has become a favorite fuel, and is brought into common use. If one is disposed to protest against such use of the golden grain, so important in its adaptations as human food, it will be well to remember that corn is actually burned, whether placed in a stove, or used as food in the form of johnny cake for a family. If we burn it in a stove by quick combustion, heat is afforded to the external body; if we place it in the stomach, it undergoes slow oxidation or combustion in the organism, and thus animal heat is secured, so essential to life and health.

If a family in Iowa have plenty of corn and no coal, is it not as important that they should burn corn to warm rooms as to eat it as food to warm the body? Should it be any more repugnant to our feelings to use precious food to secure *external* warmth than for internal, when the need is pressing? Indeed, is it wrong to burn corn, when we can do so on economical grounds? If corn is so cheap and plenty in any section that it costs less than coal or wood, why should it not take the place of these forms of fuel? We can grow wood or corn for securing artificial heat; and if corn can be raised the cheapest it will be used.

CLOVER AS A FERTILIZER.

THERE is a saying that "the cheapest manure a farmer can use is clover-seed;" and though, like many agricultural and other maxims, it requires qualification and restriction, there is nevertheless an important truth in it. Most crops taken from the land of course leave it poorer for those that may follow; but clover is an exception to this rule. Dr. Voelcker, the well-known chemist of the Royal Agricultural Society of England, says: "While, however, it holds good, as a general rule, that no soil can be cropped for any length of time without gradually becoming more and more infertile, if no manure be applied to it, or if the fertilizing elements removed by the crops grown thereon be not by some means restored, it is, nevertheless, a fact that after a heavy crop of clover carried off as hay the land, far from being less fertile than before, is peculiarly well adapted, even without the addition of manure, to bear a good crop of wheat in the following year." The clover crop in England is much relied upon to prepare the ground for wheat, although the clover is cut for hay, leaving only the stubble and roots for enriching the soil.

According to Dr. Voelcker's experiments, an acre of land in good clover yielded to the depth of six inches three and one half tons of roots, which contained 100 pounds of nitrogen. An acre in which the clover was bad yielded one and three fourths ton of roots, which contained thirty-one pounds of nitrogen. Experiments during another year showed that the crop from land where the clover was thin yielded about the same amount of roots as that from land where the clover was good. The yield of nitrogen was about sixty-one pounds per acre; of phosphoric acid, twenty-seven pounds; and of potash, about fifty pounds.

Dr. Reynolds, in an article in the *Christian Union*, on "Renovating Land with Clover," remarks: —

Of the so-called "run out" land there is probably very little which when seeded to clover would not produce one half ton per acre, while some would produce a ton. But we will suppose that it will produce only one half ton per acre. When in blossom let it be mowed with a machine and allowed to remain on the land just as it falls. The mown clover will act as a mould, enriching and keeping the surface moist, and greatly promote the growth of the second crop, which would probably be equal to the first crop. This also may be mown and left to decay on the land. The next year, after having been enriched with the growth of the preceding year, the land will probably produce enough clover to yield a ton of hay at each crop, and both crops may be mown and allowed to decay, the same as before. Thus there will have been added to the land clover equal to three tons of hay. This amount of clover would contain 168 pounds of nitrogen, which at twenty cents per pound would be worth $33.60; 36 pounds of phosphoric acid, which at twelve cents per pound would be worth $4.32; and 100 pounds of potash, which at six cents per pound would be worth $6.00: making the total value of the fertilizing elements in the three tons of clover worth $43.92. In what other way could fertilizers to this amount be more cheaply obtained? But besides the clover which has been added to the land there are the stubble and roots, which have not been taken into account, although worth fully one-half as much as the clover itself. Land after such treatment will be in good condition for crops for several years. All that is required to renovate land in this way is the use of the land for two years, a small expense for clover-seed, and the labor necessary to plough the land and mow the several crops of clover. Any farmer having land in an unproductive condition could afford to be at the necessary expense to renovate with clover. A few acres each year could thus be treated, until it had all been brought into a fertile state and the productiveness of the farm greatly increased. After the poorer portions of the farm have been renovated by the use of clover in the way indicated, it is advisable to continue the use of clover in the rotation of farm crops, in order to maintain the fertility of the soil.

CARBOLIC ACID FOR INSECTS.

NOW that the summer campaign of "the little busy" bugs has fairly begun, and the lords of creation — at least those of them who are engaged in agricultural pursuits — are put upon their defence, the following seasonable hints from a writer in the *Gardener's Monthly* as to carrying on the war may well be noted: —

Allow me to call attention to an article, the merits of which everybody knows, but which many dare not use, — I refer to carbolic acid. Prepared as indicated, it cannot, I think, hurt the most delicate house plants, and is sure to kill insect life.

My plan of preparing it is as follows: I obtain crude carbolic acid: I use it in this form because it is stronger and better for the purpose, and costs but very little (about twenty-five cents per gallon, I think). I pour a quantity of this dark crude acid into a quantity of good strong domestic soft soap;

stir well together, and allow to stand for a few hours. I then test the compound by mixing a little of it with soft water. If too much acid has been added, oily particles of carbolic acid will be observed floating on the surface. This shows that more acid has been put in than the soap will incorporate or cut, and more soap should be added to balance the excess of acid. No more definite rule can be given, as so much depends on the strength of the soap. Two or three tablespoonfuls of the acid to a quart of soap may first be tried. I prefer to make it as strong with acid as the soap will perfectly cut. A very little practice will enable any one to compound it correctly. The refined acid may be used when the crude is not at hand.

When prepared as above, make a moderately strong suds, and apply with syringe or sponge. In using on very delicate plants, should any fear be felt for the plants, they can be rinsed off after a few minutes.

My first and eminently successful use of this compound was some years since, on a block of young cherry-trees, some fifty thousand in number. The black aphis came down like a wolf on the fold, only they came not as single spies, but in whole battalions. It soon became an interesting question as to who was the proprietor of this particular block of trees — myself or the "bug Ethiopian." A disinterested observer, of judicial turn of mind, judging from the general appearance of things and the very "at home" air assumed by the bugs, would have said they had the best case. He would, at least, have been compelled to admit they had nine points of the law (possession) in their favor. I never saw the like before. The trees were alive with aphis. The only scarce things on the trees were the leaves, there being hardly enough to afford standing room for all the dusky guests However, not being a convert to the doctrine of squatter sovereignty, I declared war, and failing to decrease the number by ordinary means, I compounded soft soap and carbolic acid, and with a single application exterminated the enemy.

THE COLOR OF FLOWERS.

At a recent meeting of the Vaudois Society of Natural Science, Professor Schnetzler read an interesting paper on this subject. Hitherto it has been generally supposed that the various colors observed in flowers were due to different chemical compounds, but the experiments of Professor Schnetzler prove that when the coloring matter of a plant has been isolated by alcohol the addition of an acid or an alkali will give all the other vegetable colors: —

The peony, for example, yields, when macerated in alcohol, a violet-red liquid. If some acid oxalate of potassa be added, the liquid becomes pure red; while soda changes it, according to the proportion used, into violet, blue, or green. In the latter case, the green liquid appears red by transmitted light, just as a solution of chlorophyll does. The sepals of peony, which are green bordered with red, become wholly red when placed in a solution of acid oxalate (binoxalate) of potassa. These changes of color, which may be obtained at will, may be produced in the plant by the same causes, since in all plants there always exist acid or alkaline matters. Further, it is stated that the transformation from green into red, observed in the leaves of many plants in autumn, is due to the action of the tannin which they contain on the chlorophyll. Thus, without desiring to affirm it absolutely, Professor Schnetzler supposes that there is in plants only one coloring matter, — *chlorophyll*, — which, being modified by certain agents, furnishes all the tints that flowers and leaves exhibit. As for white flowers, it is well known that their cells are filled with a colorless fluid, opacity being due to air contained in the numerous lacunæ of the petals. On placing the latter under the receiver of an air-pump, they are seen to lose their opacity, and to become transparent as the air escapes from them.

GLEANINGS.

The Prices of Rare Orchids in England. — According to *The Garden*, a collection of orchids recently sold in London brought £1803 7s. 6d., or more than $9000. The prices of some of the choicest were as follows: One plant of Phalænopsis intermedia, £65 2s. (about $325), and another £45 4s.; Cattleya exoniensis, finest variety, with two leads, £50 8s.; Dendrobium Schrœderi, £39 18s.; Saccolabium guttatum var. Turneri, £29 8s.; Lælia purpurata, £31 10s.; Odontoglossum nævium majus, £24 3s.; Cypripedium Spicerianum, £26 5s.; Saccolabium guttatum, Burney's variety, £17 17s.; Lælia crispa superba, £26 5s.; L. elegans Wolstenholmæ, £18 18s.; Aerides Schrœderi, £16 16s.; Masdevallia ignea aurantiaca, £21; Aerides affine, £28 7s.; Angrœcum Chailluanum, £15 15s.; Cattleya labiata, £23 2s.; C. Skinneri, £21; Saccolabium guttatum, fine variety, £23 2s., and so on.

A Big Melon Patch. — Missouri boasts of possessing one of the largest and most productive melon patches in the United States. It is situated on the borders of Scott and Mississippi counties, and equals if it does not exceed in size and adaptation of soil and climate the famous melon patches of Georgia, Indiana, and the Eastern Shore of Maryland. The *St. Louis Republican* describes it as a tract of sandy prairie, four miles wide and ten miles long, with a thin warm soil just adapted to the cultivation of the melon, and such melons as are raised nowhere else in that region. There is much richer and deeper soil all around there, but it is not adapted to melon culture. This land is capable of producing 1000 melons to the acre. At a place called Diehlstadt, in Scott County, there were shipped the past season 439 carloads of 1000 to the car, and Bertrand, in Mississippi County, shipped 180 carloads, mostly to Chicago. Most of these melons were shipped in fruit cars, properly ventilated and arranged for the purpose. They found their way not only to St. Louis and Chicago, but to most of the lake cities, and even to New York and Philadelphia.

The Color of Seeds and Germination. — M. Pauchon has been experimenting with beans to determine the influence of color of seeds on germination. He finds that violet or black seeds absorb more oxygen than white or yellow to reach the same stage of development, though the latter germinate more quickly. The more frequent and pronounced pigmentation of the seeds of northern lands is a favorable circumstance to their growth, because when they germinate in light the conversion of legumine into asparagine must go on more rapidly in colored seeds.

The Rose of Sharon. — This Scriptural flower has been supposed, even by some botanical writers, to be a variety of rose, but the best authorities do not consider it such. Lieutenant Conder, in his "Tent Work in Palestine," says: "The famous Rose of Sharon is apparently the beautiful white narcissus so common in the plain in spring. The Jews themselves, in their Targum commentaries, so explain the word, and the modern name *busiel*, used by the peasantry, is radically identical with the Hebrew title in the Bible."

Ink for Zinc Labels. — A correspondent of *The Garden* recommends a saturated solution of sulphate of copper (blue vitriol) in water as the cheapest and best thing for the purpose. The writing should be done either with a hard-wood style, or, better, with a blunt quill pen.

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Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

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FALLACIES AND FRAUDS.

Fallacies and frauds are encountered in every direction by scientific and business men, and they appear in all possible forms and under all possible guises. At the present time, when speculation is rife, money abundant, and credulity cheap, schemers, dreamers, and tricksters are active, and come prominently into notice. The success of a few remarkable inventions within the past five or six years, like the Bell telephone, the Brush electric light, etc., and also the apparent prosperity of some new railroads, of which the Atchison, Topeka, and Santa Fé is a notable instance, has stimulated the public faith in alleged inventions and new enterprises to an extraordinary degree, and little difficulty is experienced in finding willing victims to visionary and fraudulent schemes. Scientific men are frequently called as experts by capitalists to examine alleged new discoveries and inventions, which they are solicited to purchase, and therefore they often encounter a class of charlatans of the most dangerous character. During the past year more of this empirical work has come under our notice, in the form of new devices for lighting and warming, new motors, and new "perpetual motions," than ever before.

It is probable that as many millions of dollars will be lost in worthless enterprises and inventions during the present speculative epoch as have been gained by the owners of the Bell telephone and all other successful devices and projects. The human mind is stimulated and excited in an abnormal manner, and a crowd of eager adventurers are ready to follow the lead of the worst charlatans.

The ordinary absurd devices, which spring from ignorance or trick, are not usually very successful in a large way; the victims are found among a class who have not much money to lose. Still, it often happens that merchants and bankers of the highest repute, who are ignorant of scientific and mechanical principles, are seriously duped by artful adventurers. Instances of this kind of fraud and empiricism are not widely known, as when the swindle is exposed both parties are willing that the transactions should remain quiet, pride holding back the one party, and satisfaction with easily acquired gains influencing the other.

Fallacies or frauds of a higher type in the line of invention or discovery are often brought to notice, and just now many of this kind are prominent. The alleged inventions are classed higher because the claims are more pretentious, and able scientific men are led astray by them. To this class belong the "Keely motor," the "water gas" delusions, "incombustible fuels," and also the "zeromotor," recently patented in this country by Professor Gamgee. With the "respectable" fallacies we are also inclined to class Edison's scheme of electric lighting by incandescence. It is because it claims to be a successful rival of illuminating gas in dwellings that we so class it. It is one thing to produce an at-

tractive light of this nature, but quite another to bring it into successful competition with cheap street gas, under the ordinary conditions in which its use is required. If it does not meet this end, it sinks to a level with the other pretty electrical experiments which are now amusing the world.

The Keely motor is an old delusion, but it has recently been again advertised, through an exhibition of its impossible capabilities to a wondering crowd in New York. Keely has found a rival in Professor Gamgee, who has just brought out his "zeromotor," and hence it may be that the new activity of the former is due to jealousy. But little is known of the zeromotor beyond what is claimed for it in the specifications of the inventor on file in the Patent Office, and from the favorable report by B. F. Isherwood, chief engineer in the United States service. This machine we judge to be a kind of "perpetual motion," which is to supersede steam. It is based on a violation of chemical and mechanical laws as recognized at the present stage of knowledge, if we do not misunderstand the language and claims of the patentee, and the explanations of Engineer Isherwood. We have not space to give in detail a description of the remarkable zeromotor, but will reserve it for a future time. It only remains to say that the most astonishing thing connected with the motor is the full endorsement of its merits by so able an engineer as Mr. Isherwood. The position which he has taken appears to be one from which it will not be easy for him to escape.

SICKNESS FROM MANURES.

The case of the Crump family at Montclair, N. J., is attracting attention to the injury which may come from the compost matters strewn on lawns, gardens, and fields. Some of our city journals have been protesting against the use of manures on our parks. They urge, very reasonably it would seem, that if fatal diphtheria was introduced into the house of the Crump family from the compost heaps in an adjacent garden, then the frequenters of our parks, and particularly sensitive people who visit these parks for recreation, will be liable to suffer from a similar cause. We have driven through Central Park when the odors were so offensive that we felt like holding our breath; we have been on country roads when we have speeded our horse to pass a field reeking with filth, which had been spread over it for the purpose of enriching the soil. Cannot our Boards of Health investigate this matter, and devise some means for preserving the productiveness of the soil without hazarding the public health?

Items similar to the above, which we take from one of our exchanges, have appeared in several papers in New York and elsewhere, during the past spring and winter. The case of the Crump family at Montclair, alluded to, was indeed a very peculiar one, and deserving of notice. The facts we obtained from a neighbor, who is well acquainted with all the circumstances of the case. The family consisted of the father, mother, and six children, and the house occupied by them had all the modern conveniences and was in a healthy locality. Mr. Crump is a very intelligent gentleman, and specially careful of all sanitary surroundings; he was indeed noted in the place for his systematic and persevering efforts to secure perfect drainage to his house, and the pipes and water-closets were all constructed with every device for preventing access of sewage gases. "Cleanliness and pure air" was the text from which he constantly preached. Under these apparently favorable circumstances for health, diphtheria in its most malignant form suddenly appeared last autumn in the family. Two of the children were stricken down with the disease, and in a short time died; in a few days another was taken ill, and still another, and out of the family of six five died. Mr. Crump himself was attacked, and narrowly escaped death. Such extraordinary fatality from a purely zymotic disease, under the best sanitary conditions, puzzled the physicians greatly, and thorough investigation was made. It was learned that a neighbor owning an adjoining lot, used as a lawn, had spread over it the contents of a *cesspool*, and that the wind, for several days thereafter, had been favorable for conveying the filthy odors towards the Crump dwelling. The opening for air leading to the furnace was upon the side towards the lawn, and through this avenue the fatal germs of disease gained access to every portion of the house, and hence the mysterious illness.

While this instance affords no ground for alarm in the use of ordinary manure upon fields, it is exceedingly important and instructive in some of its bearings upon health. The contents of a house cesspool differ in their nature most essentially from barn-yard manure, or any of the usual forms of fertilizers. Into this receptacle pass the most dangerous waste products of a family, and these are by no means what come from *water-closets*. From the *kitchen* flow the dangerous nitrogenous agents which, under the influence of putrefactive change, give rise to the fatal germs of disease. The fatty matters and nitrogenous products which pass down the sink-pipe in every dwelling are by chemical decomposition converted into bodies which are perilous in the highest degree if exposed so that they can be inhaled. The contents of cesspools should never be used upon land until after the last state of decay is reached by combining the contents with much soil, and allowing it to remain composted for at least one year. Under no circumstances should it be used on lawns, or on fields very near habitations. Sewage gases in cities originate nine tenths of the virulent zymotic diseases so fatal in their influence; and in towns, villages, and even in the dwellings of farmers the same septic agencies are at work destroying the lives of thousands.

PAINTING TIN ROOFS.

Tin roofs, as every one knows who has them on any part of his premises, are a constant care and vexation. Eternal vigilance is the price of their preservation. Even when kept well painted they have a way of "giving out" here and there in eccentric and unexpected fashion. It would seem, indeed, that the ordinary methods of painting them are at fault, and that some of the "metallic paints" and other compounds recommended for the purpose, though well enough so far as outward appearances are concerned, are not suited to preserving metals from oxidation. A correspondent of the *California Architect* gives some facts and hints on this subject which are, in our opinion, well worthy of consideration. The following is the practical portion of his article:—

All fine preparations of the carbonates and oxides of lead or copper are unsuitable for this purpose, for the reason that a *pure* oxide, when applied to other metals, will assist in the action of the elements to oxidize the metals they cover. The vehicle of all good paint is boiled or raw linseed oil, and this, when thickened with pigments, covers a less given space; and the material being an oxide, holding more oil than is imparted to the surface to be painted, soon throws off its share, and is ready to absorb the air and convey it to the body of the metal, where natural corrosion will take place, and then the two oxides unite chemically. In other words, all paints, in the absence of a solvent, which time soon releases them of, act upon iron or tin as a filter, feeding the porous spots with moisture, like a porous plaster of *rust;* and as like produces its kind, the decomposed metals work like a happy family, and roll in beds of rust. This fact is observable on flat surfaces, or in gutters where inequalities occur. Here the fine dust or powder collects, and keeps the water in them until the oil is decomposed; then the work of oxidation commences.

There is another fruitful source from which rust on the upper or under side of roofing tin comes, and that is mixing paints in common, cheap oils of kerosene, containing sulphuric acid. This oil never dries. It may harden the film of paint, so as to allow the acid it contains to corrode the tin, and the best paint in the world on the opposite side cannot prevent the acid-eaten holes from coming through; and judge the effect where both sides happen to receive the same potent mixture!

The best paint for tin or iron is composed of pure linseed oil and earthy ochres, red or yellow. The coarser granulated powders are best as a pigment as they offer less air holes, and give a firmer hold for the oil on the grits, and thus bend them to the metal. The oil in this manner gets close to the metal, and offers resistance to the air in removing the atoms from its cohesion. Beware of all metallic oxides or mineral paints, especially on lofty towers or inaccessible coverings of metal.

Roofing tin should, when laid, be kept clean from windfalls of dust, and painted once in every two or three years, by the day,— never by contract. Metals applied in the angles of roofs as flashings, where shingles are laid behind parapet walls, should be well painted, on both sides, and the exposed crevices between the laps puttied and painted, and thus cut off leaks in corners "which no feller can find out." . . .

Woodwork never should be allowed to close down on the metal, but instead a space of one or two inches should always be left, so that paint can be easily applied to all flashings on all sides, and where the dust can be easily swept out. Many troublesome leaks occur from the base of balustrades shutting down so close that dirt is completely imprisoned, and consequently in time decomposition sets in, and the metal coverings are ruined. Bay windows, with balconies, or with other ornaments, if put on with an idea of permanency, should leave ample room for the painter's brushes to reach every angle, nook, or corner, and thus save a thousand leaks.

METEOROLOGY FOR APRIL, 1881.

The sum of my observations on the weather for the past month has been as follows:—

Average Thermometer.		Lowest.	Highest.	Range.
At 7 A. M.	37.63°	22°	56°	34°
At 2 P. M.	50.37°	28°	76°	48°
At 9 P. M.	41.22°	22°	68°	46°
Whole month	43.08°	22°	76°	54°
Last 18 Aprils	43.908°	88.17° in 1874	50.61° in 1878	12.44°

The average barometer for the month was 29.776 inches; the lowest 29.25 and the highest 30.20, a range of .95 of an inch. The average for the last nine Aprils has been 29.815, while the average for the last eight entire years has been 29.919, showing that we have, on the average, a lighter atmosphere in April than the average through the year. The lowest average for the year during the last eight years was 29.878 in 1873, and the highest 29.951 in 1879, a range of only .073 of an inch! The sum of the daily variations for the April just closed was 4.18 inches, giving an average daily movement of .139 of an inch. The average for the last nine Aprils has been 5.24 inches; the average daily movement, .175. There were no large movements of the barometer during the month past, and but little stormy or windy weather.

The face of the sky in 90 observations gave 61 fair, 8 cloudy, 16 overcast, 4 rainy, and 1 snowy, or over two thirds fair. The amount of rain, including 5 inches of melted snow, was only 1.92 inches, while the average amount for the past thirteen Aprils has been 4.32 inches; the lowest 1.20 in 1869, and the highest 8.50 in 1870, a range of 7.30 inches. No thunder or lightning was observed during the month.

The direction of the wind in the usual observations gave an excess of 36 northerly and 54 westerly over the southerly and easterly, indicating the average direction to be west 33° 40′ north, or N. W. by W., three points N. of W.

The first week in the month was unusually cold, an average of 32°, or about 4° colder than the average of March, but the increasing warmth of the remainder of the month brought the temperature very nearly up to the average, though 5° below the April of 1880. The amount of rain was very small, falling almost entirely between the 12th and 15th, including a beautiful "robin snow." Although the West and South, and other countries also, have experienced unwonted severity of storm and cold the past winter, if we may rely on reports through the press, and our New England winter has been severe, yet vegetation has been so well protected by the snow that it has suffered but little. Our vines and fruit trees are putting forth very favorably, and give prospect of at least an average harvest. The season, however, is at least a week behind that of last year, though perhaps not far from the average forwardness.

D. W.

NATICK, *May* 6, 1881.

EDITORIAL NOTES.

THE ARTIST AS ARTISAN. — The *Magazine of Art*, which, by the way, has been "winning golden opinions" in a literal as well as a figurative sense, since its enlargement at the beginning of the present volume, refers as follows to the "practical" work of artists ancient and modern: —

More eminently practical men than are many of our modern artists it would be difficult to discover; and, in being so, they are but fulfilling the best traditions of their order, which boasts a Michel Angelo who could plan a fortification as well as he could paint a picture, a Rubens who was the architect of his own house and of the college of the Jesuits in Antwerp, and Leonardo da Vinci, great at mechanics, optics, hydraulics, acoustics, and magnetism, who did not disdain to invent a wheelbarrow, a spring to hold doors open, and a roasting-jack. There is nothing incongruous, therefore, in the service which has been rendered to the Italian grape-grower by Mr. Arthur Strull, the landscape-painter, who has devoted attention to the wine culture of the Roman Provinces, with the result, to it, of making some very valuable proposals for its improvement, and, to himself, of receiving from King Humbert the Order of the Crown of Italy.

AN IRON RAIN. — It is reported from Catania, in Sicily, that on the morning of March 27th last a light rain of ferruginous sand began to fall there, and continued for twenty-four hours. The sky was covered with clouds, and the barometer rose sensibly under a strong northeast wind. A thunder-storm was anticipated, but only a few raindrops fell, leaving on objects small spots of a reddish-yellow color. All day a kind of fog hung in the air, causing pain to the eyes. Next day the leaves of the trees were covered with a fine powder, like brick-dust. S. Ercole found this substance composed of fine fragments of carbonate of iron, of irregular angular or spherical form. Very strong southwest winds had blown for several days previously.

GERMAN NOMENCLATURE. — The Chicago *Pharmacist* says: A German druggist of New Orleans has invented an improved process for clarifying sugar-cane juice, to which he facetiously gives the appellation, *Chemisches zuckerrohrsaftunreinigkeitenentfernungsschnellverfahren*. A purist suggests to use in place of the foreign word "apotheker" the German expression, *Gesundheitswiederherstellungsmittelzusammenmischungsverhaeltnisskundiger*.

THE CLASH OF ATOMS. — The London *Chemist and Druggist* says: Mr. Labouchère has been cross-examining somebody on the subject of nitro-glycerine, and this is the information which he has obtained, and published in *Truth*: "The explosive character arises from this: nitrogen is composed of molecules in pairs of atoms. Nitric acid contains only one atom in its molecules. Upon this atom being set free from its unstable combination in the glycerine the two atoms of nitrogen rush together, producing a vast amount of energy of combination in the shape of heat. The gaseous products are thus heated, and an explosion takes place immediately." An inventive genius, having read the above, is engaged in preparing a patent process for heating churches by hanging two atoms of nitrogen from the roof, and causing them constantly to rush together, so as to produce a vast amount of energy of combination in the shape of heat.

ULTRAMARINE A BAD COLOR IN WALL-PAPERS. — Herr Bernbeck calls attention, in the *Pharmaceutische Zeitung*, to a possible inconvenience resulting from the use of ultramarine in the coloring of wall-papers. He states that a room covered with an ultramarine paper was observed to be tainted by a smell of sulphuretted hydrogen, the source of which long escaped detection. Eventually, however, it was associated with the paper, and a closer examination led to the conclusion that the ultramarine on the surface was being slowly decomposed under the influence of the alum in the paste used in hanging the paper. This appeared to be confirmed by the fact that a piece of the paper steeped in very dilute solution of alum gave off sufficient sulphuretted hydrogen to be perceptible to the nose and to blacken lead paper.

HOGS VERSUS BABIES. — The *Scientific American* thinks it a pity that babies have not a market value, like hogs. A death-rate among the pigs less than one third the death-rate among children in our large cities moves the Government to costly investigations of the cause, and to diplomatic correspondence with foreign nations, while Produce Exchanges get excited on the subject, and all the newspapers join in the discussion. The babies die by the thousand in New York and other overcrowded cities, and scarcely any notice is taken of the fact.

ATOMS.

A MOVEMENT is on foot to celebrate the centenary of the birth of Sir David Brewster, who, besides being an eminent scientist, was one of the founders of the British Association, and was president at its twentieth meeting; the centenary will be celebrated on the 9th of December next, and it is probable that some notice of it will be taken at the forthcoming meeting of the British Association. — Starch, according to a German authority, may be made more glossy by adding to ¼ lb. when made up into a paste from two to three spoonfuls of the following emulsion: spermaceti, 1 part; gum arabic, 1 part; borax, 1 part; glycerine, 2½ parts; water, 24½ parts. — The peculiar merit of Sydenham has been said to be that in an age of brilliant theories he applied himself to questioning Nature herself, thinking that "though the practice of physic may seem to flow from hypotheses, yet if the hypotheses are solid and true they in some measure owe their origin to practice."— Darwin acknowledged himself sold when his little niece asked him seriously what a cat has that no other animal has; he gave it up after mature deliberation, and then the sly puss answered, "Kittens." — Mr. Stephen Jenner, grand-nephew of the discoverer of vaccination, and himself in childhood the subject of many of his uncle's experiments, is living, at the age of eighty-eight, in great poverty, at Heathfield, near Berkeley, England. —The *Art Amateur*, which is on our "clubbing list," continues to be full of attractive matter for all who are interested in household art, and its designs for china painting and other branches of ornamental work are particularly tasteful. — A new revolver, devised by Herr Sederl, of Vienna, has the peculiarity that in firing not only is one cartridge discharged, but a discharged cartridge case is simultaneously driven out from the cylinder behind. — In China, large pieces of silk, often with sacred sentences written on them, are offered to the gods, and it is estimated that in the temples of Confucius alone about 30,000 yards of silk are burnt in this way; the Imperial Court at Pekin issues its edicts on silk in the imperial color (yellow), and the accrediting documents of ambassadors to foreign courts are now also of the same material. — At Liège, in Belgium, one may arrange with the telephone company to be roused at any particular hour of the night or morning; when the hour comes, the bell begins to ring, and it continues ringing till the person has answered by telephone. — To blacken brass, dissolve 30 parts of carbonate of copper in 250 parts of water of ammonia, and add 500 parts of water; the objects to be blackened are suspended in the liquid by means of a brass or copper wire, and afterwards polished with an oiled rag. — Sulphate of zinc is recommended as a substitute for nitrate of silver in acute and chronic affections of the stomach, gastralgia, and diarrhœa; it may be used in doses of 6 to 10 centigrams daily. — An "instantaneous dye" is obtained by treating the hair first with a solution of pyrogallic acid, made strongly acid with acetic acid, and when it is almost dry the silver and copper solution of the above strength is added; all shades from brown to black may be obtained by varying the strength of the pyrogallic acid from 1 to 50 grams per liter.

LITERARY NOTES.

WE have to acknowledge the receipt of the *Chemiker Zeitung* published at Coethen, Germany. For those who read German, this little weekly will prove exceedingly valuable. The price is $5 per annum in this country, including postage.

We have received from W. J. Morton, M. D., of New York, a pamphlet on *Statical Electro-Therapeutics, or Treatment of Disease by Franklinism*, being a reprint of his valuable paper in the *Medical Record*. Statical electricity was the form first employed in medicine, and in 1752 Franklin treated paralytics at Philadelphia by this kind of electricity. Galvanism and Faradism have long since driven it from the field, but Dr. Morton seems to offer some excellent reasons for a return to the use of statical electricity.

The juvenile weekly, *Golden Days*, has more than fulfilled the promise with which it started, and can be safely commended to parents in search of unexceptionable reading for their children. It has just begun a new story of travels in Australia, that land of wonders, and a sketch which will be specially valued by boys, inasmuch as it gives full and complete instructions, aided by illustrations, in all that a party can possibly want who intend camping out during the present season. The paper is for sale by all newsdealers.

Medicine and Pharmacy.

MILK AS FOOD FOR INVALIDS.

The value of milk as food for invalids is now so generally recognized that we believe our readers, both professional and non-professional, will thank us for condensing the following practical suggestions concerning its use from an article in the *New York Medical Record*, by Dr. James D. Trask: —

The most common objection offered to the use of milk is that it produces "biliousness." In many instances this is due to a disregard of the fact that milk ought to be looked upon as an article of food, and not as a mere drink; consequently, to secure its perfect digestion it should be always taken at one of the regular meals, or at a point as near as practicable midway between two meals, when something is required to bridge over this interval. Bread and milk eaten together, by both children and adults, being agreeable to the palate, is often hurriedly swallowed and in excessive quantities, and indigestion is the consequence.

Again, since modern chemistry has taught us the important part taken by the saliva in the preparation of all starch foods for digestion, we have a ready explanation of the failure of the stomach to digest bread that has been swallowed with milk without previous mastication. . . . When milk is given to either children or adults with feeble digestion, the bread should be first thoroughly mixed with the fluids of the mouth and swallowed by the child or invalid before the milk is taken; the young child must be watched as it eats, mouthful by mouthful, until the proper habit is formed.

The digestibility of milk depends, in many instances, upon the temperature at which it is taken into the stomach. This is particularly true in cases of nervous prostration. The digestive organs of these persons are almost invariably weak, and the temperature at which milk is ingested will determine whether it shall be gratefully received and readily digested, or, on the other hand, prove a source of discomfort.

On reflection it will at once appear that food, on being taken into the stomach, must first of all be warmed up to the temperature of the stomach, and this at the expense of vital heat. To raise a half pint of milk thirty or forty degrees involves the waste of considerable animal heat. This, in a healthy person with vigorous digestion may not only be disregarded, but may be agreeable in its effects; but it is far otherwise with him whose digestive organs, under any of the depressing influences productive of nervous exhaustion, are taxed to their utmost to furnish fresh supplies of enriched blood to the enfeebled nervous centres. In these cases, milk at ordinary temperatures will be felt as a cold, foreign body long after it is swallowed, and its ingestion will probably be followed by acidity and headache. It is manifestly far more economical of vital force, in these cases, to heat the food upon the kitchen range, rather than in the patient's stomach.

These remarks are especially applicable to the use of food by such persons in cold weather. In summer, when the temperature of the atmosphere and of surrounding objects approximates that of the human body, drinks may be generally taken without being first artificially heated. On the return of cold weather the stomach again becomes conscious of the additional duty imposed upon it, and artificial heating again becomes necessary. . . .

Much has been said of the value of external heat as a vital stimulant. Few, however, seem rightly to appreciate the value of heat introduced into the system as a vital restorative. No more acceptable mode of accomplishing this can be devised than the drinking of hot milk. Milk heated to much above 100° F. loses for the time a degree of its sweetness and its density. No one who, fatigued by overexertion of body or mind, has ever experienced the reviving influence of a tumbler of this beverage, heated as hot as it can be sipped, will willingly forego a resort to it because of its having been rendered somewhat less acceptable to the palate. The promptness with which its cordial influence is felt is indeed surprising. Some portion of it seems to be digested and appropriated almost immediately; and many who now fancy they need alcoholic stimulants when exhausted by fatigue will find in this simple draught an equivalent that shall be abundantly satisfying, and far more enduring in its effects. . . .

The following statement is a gratifying confirmation of the value of these suggestions: A lady, whose nervous system had been severely overtaxed by the supervision of a large school for girls, and whose digestion had become seriously impaired, went to Europe for her health. She eventually consulted Sir Thomas K. Chambers, and in answer to his inquiries stated that she had made repeated attempts to take milk of ordinary temperature as an article of food, but it had never been tolerated. At the suggestion of Dr. Chambers she began to drink it after being heated, in the same quantities as before. This proved the turning point in her case. The heated milk was well borne, and her convalescence dated from that time.

COLORS FOR SHOW BOTTLES.

In the November number of the Journal, we gave the formula for two beautifully colored liquids for show bottles, — amethystine and green. At the request of some of our readers we add a few others. A very stable red is obtained by dissolving 1 drachm of carbonate of cobalt in pure hydrochloric acid, then adding enough carbonate of ammonia to redissolve the precipitate first formed, and diluting to 10 or 12 pints. Another red is made by adding sulphocyanide of potassium or ammonia to a very dilute solution of perchloride of iron. Copper dissolved in aqua regia, and diluted sufficiently, yields a fine green. The addition of an excess of ammonia to a very dilute solution of sulphate of copper produces a blue. For yellow, a dilute solution of picric acid may be used. Aniline colors do not resist the action of light well enough.

THE CAUSE AND THE TREATMENT OF SEA-SICKNESS.

As the travelling season returns, the old question recurs, What is the cause of sea-sickness, and how can it be prevented or cured? Dr. O. G. Wood, after a discussion of the subject in the *British Medical Journal*, comes to the following conclusions: —

(1.) There is analogy between sea-sickness and the feeling of nausea often produced by fear or other disturbing mental emotions.

(2.) Sea-sickness is, in the first instance, at least, a purely cerebral phenomenon, though doubtless the repeated acts of vomiting do in time produce local gastric irritability.

(3.) This cerebral phenomenon is due to the disordered (irregular?) intracranial circulation, which, produced at first by the motion of the ship, is maintained and intensified by a secondary disturbance of the normal inhibitory function of the vagus, causing a rapid, weaker, and irregular action of the heart. Hence, the effect of the recumbent posture, and, perhaps, in part, the influence of stimulants.

If, then, my views be correct, the indication for the treatment of this truly distressing malady is to regulate the cerebral circulation; and this I would attempt to do the moment the first sense of nausea began to manifest itself. I fear we shall never be able therapeutically to prevent sea-sickness, but I do hope that we may some day be able to cure it. The next sea-voyage I have to make, I intend to take with me the following mixture, and to try the effect of a one-ounce dose twice a day: —

℞	Liquoris atropiæ	minims xij.
	Tincturæ digitalis	minims lxxx.
	Tincturæ cannabis indicæ	minims xl.
	Tincturæ capsici	f. ʒij.
	Olei caryophylli	minims xvi.
	Lymph. aurantii,	
	Mucilaginis acaciæ	ää f. ʒi.
	Aquæ	ad f. ʒviij. M.

At the same time, of course, carefully regulating the bowels, which are apt to become constipated on a sea-voyage. I am inclined to believe that the combined action of atropine and digitalis, together with the slightly exhilarating effect of the Indian hemp, may enable us to meet the indication to which I have already referred.

CHLOROFORM, ETHER, AND ETHIDENE.

In the *New York Medical Journal* for May, 1881, Dr. Gaspar Griswold, of New York, thus compares the effects of these anæsthetics: —

Clinical. — (1.) The dose (administered on a towel) is greater with ethidene than chloroform; the time required to anæsthetize the patient is longer with chloroform. (2.) Vomiting is equally frequent in the case of both agents, but is more protracted in that of chloroform; this symptom occurs independently of the duration of anæsthesia or the quantity of anæsthetic administered. (3.) With both agents the pulse is retarded and fails, while the respirations become more frequent; these changes are more frequent and more marked with chloroform. *Physiological.* — (1.) Chloroform and ethidene, in animals, reduce the blood pressure decidedly, — chloroform more rapidly and more decidedly; ether does not affect the blood pressure unfavorably. (2.) Chloroform may reduce the blood pressure suddenly and apparently capriciously; ethidene has not been observed to do this. (3.) In one instance, artificial respiration restored a dog whose heart had stopped beating, for a considerable time, from the effect of chloroform; it is therefore an efficient means of resuscitation. (4.) Ethidene seems much safer than chloroform; in no instance has the heart or respiration, though sometimes much reduced, stopped entirely during its administration. (5.) Chloroform affects the pulmonary circulation most; ethidene next; ether least. (6.) The quantity of air and the time required to restore the circulation in the lungs are in inverse ratio to the amount of anæsthetic vapor and time necessary to stop it. (7.) The changes produced in the lungs are the same in all, the only difference being in the rapidity of their occurrence; these changes are: (*a*) retardation and ultimate stoppage of the circulation in the lungs, first in the capillaries, then in the arterioles, etc.; (*b*) the epithelium cells and their nuclei disappear; (*c*) the capillaries contract, their walls become less distinct or disappear, and the contained corpuscles disintegrate. *Practical.* — (1.) It is necessary to remember that frequency of the respirations denotes heart failure, and that diminished blood pressure may show itself by respiratory failure from anæmia of the medulla. (2.) It is essential that the possibility of chloroform and ethidene — especially chloroform — reducing the blood pressure suddenly, even after their administration has been stopped for some little time, should not be lost sight of. Artificial respiration should be continued, even though all evidence of cardiac action has ceased. (3.) As regards comparative danger, the or-

der is: chloroform, ethidene, ether; as regards facility of resuscitation, the order is inverted, ether, ethidene, chloroform. (4.) The danger with chloroform is silent and sudden, approaches from the cardiac side, and is difficult to meet; the danger with ether is noisy and progressive, approaches from the pulmonary side, and may be efficiently warded off by artificial respiration. Ethidene resembles chloroform, but is less dangerous.

ANTI-FAT.

For those people whose *embonpoint* is a matter of solicitude, whether because it is uncomfortable or unfashionable, the following diet is proposed by Dr. George Johnson in the *Practitioner*: —

May eat — lean mutton and beef, veal and lamb, soups not thickened, beef tea, and broth; poultry, game, fish, and eggs; bread *in moderation;* greens, cresses, lettuce, etc.; green peas, cabbage, cauliflower, onions; fresh fruit without sugar.

May not eat — fat meat, bacon or ham, butter, cream, sugar, potatoes, carrots, parsnips, rice, sago, tapioca, macaroni, custard pastry and puddings, sweet cakes.

May drink — tea, coffee, cocoa from nibs, with milk, but no sugar; dry wines in moderation; brandy, whisky, and gin in moderation without sugar; light bitter beer, soda and seltzer water.

May not drink — milk, except sparingly; porter and stout, sweet ales, sweet wines. As a rule, alcoholic liquors should be taken sparingly, and never without food.

ABSORBENT COTTON.

This recent and useful adjunct to the surgical art can be made, according to F. L. Slocum, in the *Journal of Pharmacy*, by the following method: —

Take the best quality of carded cotton batting and boil with a five per cent. solution of caustic potassa or soda for half an hour, or until the cotton is entirely saturated with the solution, and the alkali has saponified all oily matter. Then wash thoroughly to remove all soap and nearly all alkali; press out the excess of water and immerse in a five per cent. solution of chlorinated lime for fifteen or twenty minutes; wash again, first with a little water, then dip in water acidulated with hydrochloric acid, and thoroughly wash with water; press out the excess of water, and again boil for fifteen or twenty minutes in a five per cent. solution of caustic potassa or soda; now wash well, dipping in the acidulated water and washing thoroughly with pure water. Afterwards press out and dry quickly. The amount of loss by the operation is practically ten per cent.

Absorbent cotton is simply pure cotton entirely freed from all matter that will obstruct capillary attraction.

FOREIGN NOTES.

Medico-Dramatic Criticism. — The *Lancet*, calling attention to Mr. Tennyson's new drama "The Cup," now being played in London, says that the male and female actors who have been poisoned by the same draught show quite different toxic symptoms. Mr. Irving says, —

> "I pray you lift me,
> And make me walk awhile; I have heard
> These poisons may be *walked down:* my feet
> Are tons of lead."

He is then partially raised by one of his retinue, but dies apparently in convulsions, with marked opisthotonus. On the contrary, Miss Ellen Terry, who has swallowed somewhat less of the poison, lives long enough to see the other party die, and then herself succumbs *quietly* in the arms of one of her hand-maidens. The feeling of weight in the limbs points to opium-poisoning; but, then, why the convulsions? And why do not both actors show the same symptoms?

Two New Anæsthetics. — The discovery of two new anæsthetics by Dr. Edward Tauber, of Jena, is noted, from foreign sources, in the *Philadelphia Reporter*. The one of these is methylchloroform. He tried it upon animals, and afterwards upon himself. Its action is very similar to that of chloroform, and it does not seem to possess any advantages over it. The second anæsthetic is also closely allied to chloroform, resembling it in odor, specific gravity, and boiling point. Its effect, however, would appear to be more prompt and more transient than that of chloroform. The chemical names of these anæsthetics are, respectively, monochlorœthylidenchlorid and monochlorœthylenchlorid. These brief and convenient names will, no doubt, add to the popularity of these substances.

Small-Pox in Birds. — Prof. James Law, in the *Bulletin of the National Board of Health*, states that in Europe and Hindostan variola is so common in pigeons and poultry as to constitute a veritable plague. Thus Guersent records that out of a dovecote of one thousand birds scarce a hundred could be found that did not bear marks of the disease, while Tytler says the poultry yards in India were habitually depopulated by the plague. Bechstein and others claim that this is the true small-pox, derived from the human being and conveyable back to man; while others, like Toggia and Gilbert, assert that it is communicable to the sheep. That this affection has not been recognized among us may be due to a difference in the environment which modifies the infection, or, perhaps, to the fact that men and pigeons do not live so much in common here as in Italy and India. Such an occurrence under Italian skies should, however, demand a careful investigation into the reality of such infection in our own States, and especially the Southern ones, during the prevalence of an epidemic of small-pox, so that whatever danger arises from this source may be detected and guarded against.

Diseases of Coal Miners. — The Belgian Academy of Science has received a report on the researches made by M. Fabre regarding the diseases to which coal miners are especially liable. He finds that, as coal absorbs rapidly up to one hundred times its own volume of oxygen, the air which the miners have to breathe is deprived of oxygen to a hurtful degree; the atmosphere of a mine is also further vitiated by the gaseous carbon compounds given off by the slow combustion of the coal. M. Fabre concludes that a supply of air is more essential than that of light, and even the best ventilated mines require better ventilation.

Strychnia as a Physiological Antidote to Alcohol. — Dr. Luton, in the *Bulletin de Thérapeutique*, claims that by frequent experiment he has demonstrated that strychnia is the best physiological antidote in cases of chronic alcoholism. He has used hypodermic injections of the sulphate of strychnia in delirium tremens with markedly favorable results, relieving tetanic rigidity and quieting delirium.

Phosphate of Bismuth as a Substitute for the Subnitrate. — Dr. Tedenat prefers the phosphate of bismuth to the subnitrate. The anti-diarrhœic effect of the phosphate is exercised in the same manner as that of the subnitrate, but it may be given in smaller doses, one or two grams (15–30 grains), as a general thing. It is administered in the same way as the subnitrate, either in powder, in suspension, or in pastils.

The Advantage of Being Dissected. — It may sometimes be lucky for a man that his body is given over to the doctors to be dissected. A foreign journal states that recently, in Switzerland, a man, apparently frozen to death in the neighborhood of Solothurn, was handed over to the Cantonal hospital for dissection. When the supposed corpse had been laid on the dissecting-table the mistake was discovered, and means were taken to infuse new life into him, which succeeded so well that he is now in his usual health.

What John Hunter Did. — In the Hunterian oration recently delivered by Mr. Luther Holden, he said: "It was the great mission of Hunter to found pathology on comparative physiology; to rescue disease from the grasp of quacks, fanatics, and system-mongers, and to restore it to the rank where Sydenham would have placed it, — beside the beneficent regulations of nature which govern the body in health; and he must read history amiss who does not set a high value on such work."

The Legal Value of Vows Made in Pain. — In a case tried at Paris, where a surgeon claimed 6900f. ($1380) for 31 dressings of a wound and for accessory expenses, the court ruled that "there could be no valid agreement between the patient and his doctor; for the former, struggling for his life, is no longer master of his will, and if he makes any agreement it is only fear and necessity that guide his will."

New Test for Arsenic. — Brame recommends the use of baryta in place of sodium carbonate and charcoal in the ordinary dry test for arsenic. If arsenious oxide is heated with baryta, a mirror is obtained consisting partly of metallic arsenic and partly of barium arsenate. The test does not succeed so well with arsenious sulphide.

FOR THE PHARMACIST.

Dialysed Iron. — Mr. Rother, in *New Remedies*, states that the so-called dialysed iron of commerce is made by saturating a solution of ferric chloride with ferric hydrate. In giving directions for this procedure he proposes a solution of triferric hydrodichloride equivalent in iron strength to the officinal solution of ferric sulphate. He writes as follows: Upon 15 troy ounces of disodic carbonate pour half a pint of water, and apply heat until a hot solution is obtained; then pour into this 1 pint of solution of ferric sulphate in a rapid and continuous stream, and with constant stirring of the mixture. Keep up the heat a few minutes until effervescence nearly ceases, and add water to the measure of 2 gallons. After a sufficient repose, decant the supernatant liquid, and wash the precipitate three or four more times in a similar manner, or until the washings yield no trace of reaction with barium chloride. Collect the ferric hydrocarbonate upon a filter, and when the excess of water has drained away dissolve it in 1 troy ounce of chlorhydric acid with the aid of heat, and evaporate to the measure of 1 pint, if necessary.

The Size of Drops. — A correspondent of the *Druggists' Circular*, referring to the recent objections made to prescribing by "drops," says: "A prescription lately handed me to prepare called for liquor arsenici et hydrargyri iodidi, gtt. xcvi., and with the other ingredients formed a four-ounce mixture. Now in such a case the pharmaceutist, who drops the solution and counts the 96 drops, follows the letter of the prescription; but the strength of the compound will probably never be twice alike. The probable variation might seem to be of little account practically; but I think this would not be so in many cases, as the possible range is large; and consequently it is a careless way of writing. From our shelf bottle 96 drops of Donovan's solution measured 124 minims; from the lip of a minim graduate, 150 minims; from a so-called minim dropper, 106 min-

ims; from a smaller dropper, 94 minims. Here is a variation of 56 minims between the extremes of 96 drops, as tried only from four such surfaces as might be employed by the dispenser."

HERMETICAL STOPPERS FOR INFUSIONS, ETC. — A German pharmacist states that for some years he has used, with excellent results, solid paraffine for stopping vessels containing liquids which change easily in the air. The infusion or syrup should be in bottles filled nearly to the brim, and melted paraffine being poured on will form an air-tight seal on cooling. When the contents are required for use the paraffine can be easily broken up with the finger, and the fragments may be collected in a suitable vessel, washed, and remelted for subsequent use.

BLEACHING BEESWAX. — The following is said to be a good method of bleaching beeswax on a small scale, which may be useful to apothecaries and others. Melt the wax and separate it from all impurities by straining it through a piece of cotton cloth. Then take any long, deep vessel of tin, resembling in form a vat, or, if nothing better adapted is to be had, even an ordinary tin pail will answer. Put in the wax and pour on boiling water until the vessel is nearly full, and keep it hot. Take a sheet of common glass, which should be thoroughly polished, dip it in cold water, then dip it quickly in and out of the wax, and then immediately into the cold water. When cool, a thin sheet of wax will be found on each side of the glass, which can easily be removed if the glass has been previously polished thoroughly. The glass should be well polished after each dipping, and any small particles of wax which may adhere should be carefully removed with a spatula, the whole process being repeated until all the wax is disposed of. Then "sheet" the wax, spread it upon clean paper and place it in the sun to bleach. Of course, the thinnest sheets will be formed upon the glass when the wax is at a boiling temperature, but if the wax is allowed to cool, they become considerably heavier, and are not nearly as smooth. Their roughness may be removed by polishing with a burnisher in a warm room.

CLEANING MORTARS. — A correspondent of the *Journal of Pharmacy* recommends for cleaning mortars which have contained oils, balsam, tar, assafœtida, resins, etc., first to scrape well with a spatula, then rub with paper, then with cotton batting soaked with turpentine, then with cotton soaked with soap liniment. For iodine stains use a little potassium iodide in solution. For permanganate of potassium use muriatic acid. For indigo use sulphuric acid.

SELECT FORMULÆ.

IMPROVED DOVER'S POWDER. — Dr. H. D. Vosburgh, of Lyons, writes to the *New York Medical Record*: —

"In your issue of February 12th I find a note from Dr. S. Mitchell, Jr., giving the composition of *his* Dover's powder.

"Every practitioner knows what a valuable remedy Dover's power is; still, that prepared according to the formula of the United States Pharmacopœia is susceptible of improvement. I find, on inquiry, that many physicians who dispense their own remedies have their own Dover's powder.

"After trying various compounds, I have for several years used the following with results entirely satisfactory.

"In order to keep gum-camphor in a perfect powder, I grind it with an equal bulk of the English creta præparata; this I dispense as pulverized camphor. Now my Dover's powder is compounded as follows, namely: —

℞ Opii pulv.,
Ipecac pulv. . . . . ää ℥i.
Potass. nit. pulv. . . . . ℥iv.
Pulv. camph. (prepared as above noted)
Rad. glycyrrhiza pulv. . . . . ää ℥ij. M.

"This seems to me a better anodyne, a better sudorific, and a better hypnotic than any other compound I have ever seen called Dover's powder."

COLD CREAM. — A correspondent of the London *Chemist and Druggist* gives the following formula for "a cold cream that will keep any length of time unaltered either in stock jar or covered pot: —

Cetacei et ceræ alb. . . . . ää ℥i. ℥ij.
Ol. amygd. dulc. . . . . ℥ x. ss.

Dissolve in pot, in water-bath, then add, stirring meanwhile —

Spt. vin. rect. . . . . ℥ss.
Aq. destill. . . . . ℥ij.

Stir constantly with bone or vulcanite knife, and, when it begins to cloud, add —

Ott. rosæ . . . . . ℥ss.

Whip with the knife till nearly cold, when pour into pots; slightly tap the pots on the counter, and do not touch with the knife. You thus get an article not only uniform, but with a nice surface. The constant whipping gives it a beautiful opaque whiteness."

ANODYNE LINIMENT. — The *Southern Practitioner* gives the following: —

℞ Chloroformi,
Tr. aconiti . . . . . ää 1 ounce.
Tr. sapo. comp. . . . . 2 ounces. M.

Sig. Use externally. This makes a neat preparation, and is most serviceable in arthritic rheumatism, intercostal or temporal neuralgic pains, etc.

FACETIÆ.

CARLYLE AND HIS DYSPEPSIA. — In his "Reminiscences," Carlyle tells how he once rode 60 miles to Edinburgh "to consult a doctor, having at last reduced my complexities to a single question. Is this disease curable by medicine? or is it chronic, incurable except by regimen, if even so? This question I earnestly put; got response, 'It is all tobacco, sir; give up tobacco.' Gave it instantly and strictly up. Found, after long months, that I might as well have ridden 60 miles in the opposite direction, and poured my sorrows into the long hairy ear of the first jackass I came upon, as into this select medical man's, whose name I will not mention."

JOSEPH COOK ON PHYSIOLOGY. — The London *Medical Press and Circular* says: "There is no class of men who are more alive to the evil effects of intemperance than medical men; at the same time, and from that conviction, they must deplore such *ad captandum vulgus* arguments as those advanced by the Rev. Joseph Cook in his Free Assembly Hall lecture in Edinburgh. The lecturer, we are informed, proceeded to illustrate, by pouring alcohol on the white of an egg, the effect of drinking upon the albumen in the system! And he further stated that by hardening the albuminous substances in the body *alcohol left scars on the brain and nerves which could not wash or grow out any more than scars in the skin.* In a professional journal it would be insulting to the sense of our readers to point out the groundlessness and fallaciousness of such statements and experiments."

A SLIGHT MISTAKE. — *Punch* has the following: *John Thomas:* "Did you ring, sir?" *Surgeon* (just arrived at country house): "Yes. Why have you laid out my surgical instruments on the dressing table?" *John Thomas:* "Surgical instruments, sir? I thought them things was what you dressed for dinner with!"

FACE POWDER. — *New Remedies* asks if some chemist won't invent a face powder that does not contain lead, and tastes good? Our young men are all dying of lead poisoning, and kissing is going out of fashion. We would suggest burnt cork flavored with extract of cardamom seeds!

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PHYSICAL APPARATUS. — Curt W. Meyer has constructed small sets of physical apparatus well adapted to school and private instruction, which he sells at prices within the reach of all. Having examined his apparatus we are able to indorse it as being all that is claimed for it. His $28.00 Holtz Electrical Machine is an exceedingly interesting piece of apparatus, and worth what it costs for amusement alone, while for illustrating electrical phenomena it is unsurpassed. Prof. Meyer also manufactures electro-medical apparatus of new and improved forms for physicians' use. For amateurs he furnishes telegraphic instruments, sounder, key, and battery, complete, at $6.00 and upwards.

WE take pleasure in calling the attention of our readers to the advertisement of Messrs. J. & H. BERGE, successors to Hall & Benjamin. Messrs. Berge are one of the oldest firms in this line of business in the United States, having carried on a very successful business for many years on John Street, New York. Since taking possession of the stock of the late firm of Hall & Benjamin they have enlarged it in all its departments, so that they now carry one of the largest and most complete stocks of Chemical and Physical Apparatus in this country. To their own experience is now added that of Mr. Henry D. Hall, who still remains with the firm. From a long personal acquaintance we can assure our readers that Mr H. is well worthy of their confidence and patronage. Mr. Hall is always ready to show goods, and we advise our friends to drop in and see him when they visit New York.

HYPODERMIC TABLETS. — The advantage of administering the alkaloids, especially morphia, hypodermically, is generally admitted, yet the difficulty of preparing and preserving suitable solutions for this purpose has led some physicians to lay aside the hypodermic syringe. To overcome this difficulty Dr. H. A. WILSON combines the requisite dose of the alkaloid with a sufficient quantity of an inert salt, and compresses the whole into a tablet that can be quickly and easily dissolved when needed for use. Such tablets, containing sulphate of soda and a sulphate of the alkaloid, are now prepared by JOHN WYETH & BRO., and will prove, we believe, a great convenience to the physicians.

THE Earphone is the name of a new instrument for the use of the Deaf, which appears from its construction to be the most perfect article for the purpose in the market. See advertisement on page 4.

THE article on "Tuberculosis," resulting from deficient nutrition, on page 2 of THE JOURNAL, is well worthy the attention of our readers.

KNAPP'S EXTRACT OF ROOTS. — One of the most healthful and pleasant beverages in use is the Root Beer made from the above extracts. Having been thirty years in the market, with steadily increasing sales, is satisfactory evidence of its popularity.

Boston Journal of Chemistry
AND
POPULAR SCIENCE REVIEW.

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Familiar Science.

MATTER IN A WHIRL.

WE really know nothing of the ultimate constitution of matter, and it is hardly conceivable that we ever shall understand it perfectly. The "atomic theory" which is generally accepted by physicists is a mere theory; and even that leaves the nature of the atoms a mooted point. We say that all bodies are made up of molecules, and that these are in turn made up of atoms; but even the molecules are far too minute to be seen with the most powerful microscope. What are the atoms, yet more minute, of which the molecules are composed? Their name implies that they are indivisible, and indivisible they certainly are by any means at our disposal.

Of the speculations as to the nature of the atoms, that which is known as the "vortex theory" devised by Sir William Thompson, is now received with most favor by leading scientific men, and a brief outline of it may be of interest to our readers.

According to this theory the atoms are minute whirling rings in the *ether*, or the highly rarefied and elastic fluid which is supposed to fill the entire universe and to permeate all bodies. It is by means of this ether that light and heat are transmitted through space. They are supposed to be waves or undulations in the ether, just as the atoms are supposed to be whirling motions in it.

A strange notion this, you may say, that all solids, liquids, and gases, all the varied substances and forms of substances in the material universe, are made up of nothing but rotating ring-like portions of a subtle imponderable fluid! How can we get a clear notion of such forms in the ether, how illustrate them in any experimental way? This can be done very simply, and the experiments are well worth trying, whether we accept Sir William Thompson's theory or not.

The only apparatus that we need is a cubical box about a foot square, having a piece of tightly stretched cloth for one side, and a round hole an inch or so in diameter in the opposite side. On the bottom of this box put a saucer containing a little strong muriatic acid, and another containing some strong ammonia water. The vapors from these liquids will fill the box, and the chlorine of the acid will unite with the hypothetical ammonium of the ammonia to form solid particles of ammonium chloride (sal ammoniac), which will fill the box like a white smoke. If now we strike the cloth side of the box a sudden blow, a ring of this smoke will issue from the opening, as shown in Figure 1.

Fig. 1.

Let us start several of these rings, and watch their behavior. We might expect that they would simply float quietly away in the air; but we find that they manifest a variety of curious phenomena. We cannot fully describe all these here, but must confine ourselves to some of the more important ones.

The rings will move through the air as if they were solid bodies. When two of them come into collision they are thrown into energetic vibration. If two happen to be moving in the same direction, with their centres on the same line, and their faces perpendicular to this line, the one in front expands and goes slower, and the one behind contracts and goes faster, till it overtakes and passes through the one in front; it will then begin to expand and to move slower, and allow the other one to pass through it in turn; and so on alternately. In all these changes of form each ring preserves its individuality. Each, as it floats through the atmosphere, is all the time made up of precisely the same particles of air and smoke, and these are precisely the same particles of air and smoke that were driven out of the box by the blow on its back. It is not merely particles of sal ammoniac which are moving through the air, but a portion of the air has become, as it were, a different substance from the surrounding air, through which it moves very much like a solid body. If we attempt to cut one of these rings, it either recedes from the knife or wriggles around it, so as to escape without injury.

Every portion of the ring is continually rolling round on its circular core The particles on the inside of the ring are moving forward, and those on the outside moving backward, as shown by the arrows in Figure 2.

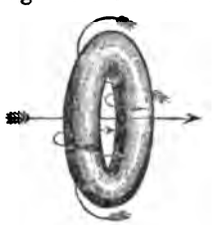

Fig. 2.

Helmholtz has shown by mathematical investigation that were such vortex rings once started in a perfect fluid, such as the ether is assumed to be, they would always retain their individual character, and would be absolutely indestructible except by the power which created them. No process at our disposal could either start such a vortex ring in the ether, or destroy one which was already in existence. These vortex rings might be either circular in form, or have any conceivable number of knots and windings upon them.

Prof. A. E. Dolbear has been studying these rings, and has noted several new and curious phenomena which he describes in a recent number of *Science*. If *two* holes are made about two inches apart in the side of the box, two rings may be started at once, having the same rate of rotation. Two such rings, if not too far apart, will sometimes approach each other and *combine to form one ring*, which continues to move in the same direction. "The combination is effected by the breaking of each at the point of contact, and the welding of the opposite parts of each ring to form one ring with twice the diameter." Two of these rings may in like manner combine to form a new one. We may suppose that we have here an illustration of what occurs when the different substances unite to form a chemical compound, as in the case of the chlorine and ammonium which furnish the material for the illustration. The whirling rings of the two gases combine, and the result of the combination is a new set of rings which have new properties.

The following are a few of the other phenomena noticed by Professor Dolbear: —

If one vortex-ring strikes another vortex-ring upon the edge, the two rings will bound away from each other as though they were solid elastic bodies, each one vibrating as it recedes.

If a vortex-ring passes near any light object, as, for instance, a silk thread suspended, or better still a small cloud of smoke or ammonium chloride dust, the latter will be seen to be apparently repelled from the front of it, but attracted and drawn into the ring from the rear.

If a vortex-ring be projected parallel with any surface, and at not too great a distance from the surface, the ring will move in a curved path toward it and strike it.

The structure of the vortex-ring is concentric; that is, a cross-section of a ring generally shows a series of several concentric circles, with a hollow centre. The middle of the ring appears to be a cylindrical unoccupied space.

Most of these phenomena are best shown by

having only one hole in the side of the box; and if we wish to exhibit the rings to a room full of people, the hole should be about three inches in diameter. The rings can then be projected with force enough to carry them ten or fifteen feet from the box. To make one ring overtake another, hit the cloth a harder blow. In order that two rings should combine, it is necessary that they have the same rate of rotation, and this is best secured by the use of two holes, the rings being produced by a single blow.

All these experiments are pretty and interesting in themselves, aside from the theoretical inferences that have been drawn from them; and, as will be seen, they require no apparatus except such as any one can make for himself, and no special skill in manipulation.

WHAT IS GLUCOSE?

GLUCOSE is the sugar of the future. Oppose it as you will, it is daily increasing in importance and in the number of its uses. In climates where the sugar-cane will not grow, and in countries where the sugar-beet cannot be cultivated with profit, there is a wide field for glucose. Wherever corn, grain, or potatoes thrive, there glucose factories will flourish. Glucose differs as much from cane sugar as tallow from lard, or butter from oleomargarine. Both kinds of sugar are sweet, although in a very different degree, and for many purposes one can be substituted for the other without the consumer being aware of the fact.

The manufacturers limit the term "glucose" to the thick syrup which neither solidifies nor crystallizes on long standing. The same substance in a solid state is called "grape sugar," but there is no chemical difference between the two. The name "grape sugar" owes its origin to the fact that a kind of sugar found in grapes and other sweet fruits has the same chemical composition as that made from starch by methods that we shall presently describe. This real grape sugar is often seen as an incrustation on raisins and figs. Honey also contains grape sugar, and it was there it was first discovered by Lowitz in 1792.

Cane sugar, whether obtained from the cane, from sorghum, from corn stalks, from the maple-tree, or from the sugar-beet, is identically the same, and when perfectly pure its origin cannot be determined by chemical or physical tests. Its composition is expressed by the formula $C_{12}H_{22}O_{11}$. It forms large crystals belonging to the monoclinic system, as is beautifully shown in rock candy. It is exceedingly permanent, and is incapable of undergoing fermentation until it has first been converted into glucose. In all these respects it differs from grape sugar. The latter has for its formula $C_6H_{12}O_6$. It crystallizes with more difficulty, and usually in warty masses. It readily undergoes fermentation, splitting up into alcohol and carbon dioxide. It possesses the power of reducing copper, silver, and other salts, which cane sugar does not; yet it resists the action of cold oil of vitriol, which chars cane sugar at once. It is less soluble than cane sugar and about one third as sweet.

Glucose can be made from any of the carbohydrates, starch, dextrine, cellulose, etc., but is generally prepared from starch. In this country corn starch is used, while abroad potato starch is preferred because it is cheaper.

In the manufacture of beer and spirits from grain of any sort the first operation consists in converting the starch of the grain into grape sugar, which is most readily accomplished by allowing the grain to germinate. The diastase then produced effects the desired conversion. Dilute acids have the same action on starch, and while almost any acid can be employed, even carbonic acid, glucose manufacturers generally prefer sulphuric acid.

The first part of the operation is essentially the same as in the manufacture of starch. The corn is soaked in water or dilute alkali, then crushed and washed on sieves as long as the water runs off milky. The starch is then allowed to settle, and the supernatant water drawn off. The next operation in making starch consists in drying it, but where the starch is to be converted into glucose this part of the operation can of course be omitted. The starch is next subjected to the action of very dilute sulphuric acid, in the proportion of two pounds of acid to 100 pounds of starch, and 300 to 400 of water. The water is first heated to boiling; the acid, diluted with three times its weight of water, is then poured in; and afterwards the milky mixture of starch suspended in water is allowed to flow into the boiling acid. The first change that the starch undergoes is a conversion into dextrine. By long-continued boiling this is changed into glucose. When one part of the liquid mixed with six parts of absolute alcohol no longer gives any precipitate of dextrine, the boiling is stopped.

The next step in the operation is to neutralize the free acid. For this purpose lime, chalk, whiting, or marble dust may be employed. An insoluble sulphate of lime is formed, which is easily removed. It has been proposed to use barium carbonate for neutralizing the acid, as its sulphate is totally insoluble, whereas some of the sulphate of lime stays in solution. The cost of barium carbonate is an insuperable objection, and, being poisonous, its presence is less desirable than that of lime.

The syrup is now evaporated in shallow pans until it reaches a density of 1.12 (16° Baumé), which causes the sulphate of lime to be precipitated, while the other impurities rise as scum to the top. It is afterwards filtered through bone-coal, and then evaporated to a greater or less extent, according as a syrup or a solid is desired. About twice as much acid is employed for making grape sugar as when glucose syrup is desired.

From the above description it will be seen that glucose, properly made, is in no way an objectionable article. It may disagree with some people, just as honey does, and for the same reasons. Persons who are troubled with dyspepsia, sour stomach, etc., often find difficulty in partaking of glucose, because it ferments so quickly in the stomach, as might have been expected. A German professor, Dr. J. Nessler, of Baden, has attempted to prove that glucose from potato starch contains a poisonous substance, but his method of isolating it might equally well have produced it. To remove all the glucose he added yeast to set up a fermentation, and when that was ended expelled the alcohol by boiling. His experiments were made with the unfermentable residue. Another gentleman, Mr. W. H. Langbeck, has proved that a bitter substance resembling colchicine is sometimes formed during fermentation. He has even succeeded in separating and crystallizing this bitter substance, and has described its reactions.

Some chemists claim to have discovered all sorts of poisonous substances in glucose, such as lead, tin, sulphuric acid, etc. We have not been so fortunate as to make any such startling discoveries. Of course, like every other manufactured article, much depends on the care taken in its preparation. The presence of sulphate of lime in very small quantities might be expected. Dextrine is often present in considerable quantity, but this is both sweet and wholesome, in fact highly nutritious.

The uses of glucose are very numerous, although it is seldom sold to the public under its real name; but under the alias of "golden drips," "sugar-house syrup," "strained honey," and even Vermont maple syrup, its sale is very extensive. It is largely employed by confectioners for making candies, by wine-dealers for strengthening wine, by brewers to add body to their beer. Dr. Kedzie, of the Michigan Board of Health, reports that of seventeen samples of table syrup tested by him, fifteen contained glucose. Of twenty samples analyzed in Chicago, only one was unadulterated.

We give below the result of our own analyses of two specimens of American grape sugar obtained in New York city, and of two samples of candy obtained in Boston, one of which, usually called French candy, contains about eight per cent. of glucose.

	Grape Sugar. I.	Grape Sugar. II.	Candy. I.	Candy. II.
Glucose	75 49	76.85	17.50	8.10
Water	11.52	8,16	-	-
Ash	0.66	0.26	-	-
Sulphuric acid	0.27	None.	Trace.	None.

A sample of maple sugar that we tested was found to be nearly free from glucose. It should here be remarked that glucose is often present in molasses and syrups that have not been adulterated, having been formed from the cane sugar by boiling; also, that there are other substances beside glucose which possess the power of reducing alkaline copper solutions.

We do not believe that pure glucose is an injurious substance when properly made, but to sell it under the name of cane sugar, when it is but one third as sweet, is a fraud; and to charge the price of cane sugar, when it costs but *three cents a pound* to make it, is a swindle. That it pays to make it is evident from the fact that there are more than twenty glucose factories in this country turning out over one million pounds per day of grape sugar and glucose.

COOKERY FOR INVALIDS.

THE following, from a recent English journal, contains some hints which form a suggestive appendix to former articles that have appeared in our columns on this important subject: —

Give the distasteful food the semblance of something that is particularly palatable to the patient, and your efforts will be rewarded by your soon be-

holding him eating with an appetite. For instance, you are bound to give mince, and equally bound not to give pastry. Your patient, however, is fond of pastry. What you must then do is this: You must make a *vol-au-vent* case, and fill it with minced chicken or lamb. Then, though your patient may not eat a single mouthful of the crust, the look of the whole thing calls up the pleasurable feelings associated with the *vol-au-vent*, in lieu of the feeling of disgust excited by a dish of mince. On this day you will find that he enjoys his meal; on another occasion you can surround the mince with a wall of mashed potatoes or boiled rice. Again, you may send up your mince in the guise of a "cottager's pie." This, as every one knows, is just a layer of minced meat placed at the bottom of a small pie dish, covered with a three-inch layer of potatoes, put in the oven and nicely browned. Yet, again, you may put the mince into rissoles, or roll it up inside batter, or, failing all these, can make three-cornered sandwiches with it. In this last case the mince should be of chicken, and, instead of buttering both pieces of the bread, you might spread the faintest *soupçon* of potted ham on one of them.

In catering for such an invalid as we have in view, our aim is to get him to take a stipulated amount of meat per diem. The doctor has ordered him so many ounces a day, to be given in any form (save the solid) in which he can be induced to swallow it. As long, then, as this quantity gets taken, our object is secured. We may give it, if we like, through the medium of soup, or through that of meat-jellies. It is quite possible, therefore, to let two, or even three, days in the week pass without mince in any one of its Protean shapes being present. We can make a chicken panada, and put as much as is equivalent to the specified number of ounces into a plate of soup; or, again, we can make some strong ox-tail jelly, and administer a couple of glasses to him; and then, when we have given the due allowance of meat, we are able to include in that day's *menu* things which are more appetizing, though less nourishing, than the mince. We can give him a souffle flavored with vanilla, served in a smoking tin, with a snowy white napkin round it. Charlotte russe, macaroni with sweet sauces, roast apples (to be eaten with baked milky rice pudding), stewed pears covered with cream, and innumerable other puddings can be given with great benefit, since, by causing your invalid to derive pleasure from some portion at least of his meal, you prevent him from regarding all eating as distasteful.

But, above all, it must be remembered that the way in which things are served is the most important element in the matter. The trays should be covered with the freshest of cloths, and even be rendered bright by a vase of flowers. You should never set a plate before an invalid containing the exact quantity of meat, fish, or pudding you want him to eat. If you do, he will be sure to leave half, with the complaint that he has no appetite. He should always have everything served on small dishes, and should be allowed to assist himself. His vegetables and sauces should never be heaped on his plate, but should come up in tiny vegetable dishes and pretty sauce-boats. Above all, he should never be told beforehand what he may expect, so that his meals have all the charm of a surprise. In short, an invalid's meals should be so managed that he should look forward to them with pleasure as to a break in the day's monotony, instead of turning from them with disgust, as from some disagreeable ordeal to be undergone with all the resolution he can muster.

A TEACHER was explaining to a little girl the meaning of the word "cuticle." "What is that all over my face and hands?" said he. "It 's freckles, sir," answered the little cherub.

SCIENTIFIC BREVITIES.

AMMONIA EVERYWHERE. — Dr. Angus Smith, in a parliamentary report, comments upon the universal presence of ammonia, which he has found upon every object he has examined, indoors and out-of-doors, in the town and in the country. Ammonia, it is believed, may be an index of decayed matter. By suspending a piece of glass anywhere, and after a while washing the outer surface with pure water by means of a spray bottle, and applying a Nessler solution to the washing, the presence and quantity of ammonia are ascertained. This Dr. Smith hopes to make "a ready popular test for air, — a test for sewer gases, for overcrowding, for cleanliness of habitations and even of furniture, as well as for smoke and all the sources of ammonia." In a part of the report dealing with the effect of gases upon vegetation, he quotes a German man of science, named Mohr, as saying that thirty-six years had done more to destroy the Luxor obelisk in Paris than as many centuries in Egypt, and that the climate of London will be still more destructive to Cleopatra's Needle. "This," adds Dr. Smith, "we may readily agree to, as we see already a change, so far as color is concerned, and the black always contains the acid" (sulphuric acid). In conclusion the professor speaks of the "enormous value of the ammonia obtainable from the fifteen millions of coal now made into coke, if the process, said to be so successful at Besseges, should be found successful here. If we were to treat all the coal used in the country in the same way, we should have above six times as much ammonia, which would be capable of increasing our crops by £50,000,000 sterling of value."

SOMETHING NEW IN OPTICS. — According to M. Trève, the flame of a lamp appears brighter, and a vertical shaft, a post, or mast is seen more distinctly, through a vertical than through a horizontal slit, while a house, a landscape, or the disk of the sun or moon is perceived more clearly through a horizontal slit. He finds similar differences in photographs, according as the light passes from the object to the plate through a vertical or a horizontal slit, and ascribes the results to the action of diffused light.

THE WORK DONE BY THE HEART. — An English writer says: "We may form some conception of the enormous energy of the human heart when we reflect that a good climber can ascend only 9000 ft. in nine hours, that is, can raise his own weight only 1000 ft. in an hour, that is, of course, continuously for any length of time, while the work done by the heart is equivalent to raising its own weight (10 oz.) 13,860 ft. high. And we may put this even more strikingly by pointing out that the most powerful engine ever made by man, the 'Bavaria' locomotive of the Vienna and Trieste railway, can only raise itself through 2700 ft. in an hour; that is, its energy is less than one fifth of that of the human heart. Of course, the actual amount of work done, both by engine and climber, is much greater than that done by the heart; but relative to weight, the energy of the heart far exceeds that of the other two."

THE BEARD IN ETHNOLOGY. — Mr. C. S. Wake, in the *Revue d'Anthropologie*, remarks that but few writers on ethnology have recognized the beard as an important race character, and many travellers have been so careless as to make no observations as to the presence or absence of the beard among the peoples whom they have visited. Mr. Wake, after an elaborate ethnological survey, concludes that the hair on the face is a character of much value to the anthropologist. It is curious that the most highly civilized races are those most plentifully supplied with beard; and, in fact, the beardless peoples may be compared to the children, and the bearded to the adults, of the human race.

THE TELEPHONE THROUGH WATER. — *L'Electricité* states that M. Dohrn has introduced the telephone in connection with his scientific explorations of the bed of the Bay of Naples. By its use the diver and the boatman overhead are able to communicate with each other quickly and intelligibly.

CONVERTING SOUND INTO LIGHT. — A French scientist claims that he has succeeded in reversing the result obtained by Professor Bell, in producing light from sound. He has described an experiment to the French Academy, by which he contends a transformation of sound into light is produced.

CARBONIZATION OF WOOD UNDER PRESSURE. — At a recent meeting of the Silesian Society for National Culture, Herr Göppert exhibited a half-carbonized piece of pine wood which had lain two years under a steam-pipe of 250 cwt. at a mine near Schoppinitz. It had been compressed to a fourth part of its thickness, and had come into the half-carbonized state through the action of *pressure alone*, as little moisture had access, and the temperature was never above that of the surrounding atmosphere. It had quite the look of a dark brown-colored bituminous wood of the tertiary brown coal formation, but it was without the smell observed in burning bituminous wood. The change of volume was at the cost of the water contents of the wood. A considerable amount of oxygen and hydrogen had come off as water, and the composition approximated to that of peat of the older peat formations.

SANITARY AND HYGIENIC NOTES.

PURE AIR IN WORKSHOPS. — A correspondent of a Montreal journal remarks: "Some workmen think themselves 'tired' when they are only poisoned. They labor in factories, breathe air without oxygen, and in an atmosphere of death. They are too often allowed to smoke, and thus add fuel to the flame that is consuming them. They knock off work 'tired' and listless, when they are merely weakened by foul air, and made dull and heavy by an atmosphere charged with disease. They keep the windows shut and close the door on health, while they lift the gratings of the tomb by breathing and re-breathing the poison from their own lungs, and the floating particles of matter about them. Open the windows, let in the sunshine and the breeze, stop smoking, and you will soon find that it is the poison of confinement, and not labor, that wearies and tires."

AN IMPROVED RESPIRATOR. — A new respirator for use in impure air, invented by Dr. Rennecke, has the peculiarity that separate air-passages are afforded for inhalation and for exhalation. A light mask of gutta-percha, covering the nose and neighboring parts, has before the point of the nose a prolongation containing wadding (pure or saturated with a suitable substance), between two pieces of wire-gauze, and having an aperture below, covered by a hard rubber valve which opens outwards. The inspired air must pass through the wadding, while the expired air preferably passes out through the aperture, so that no precipitation of the products of expiration takes place in the wadding.

THE BRAIN WORKER. — So long, says a medical authority, as the brain worker is able to sleep well, eat well, and take a fair proportion of out-door exercise, it is not necessary to impose any special limits on the actual number of hours he devotes to his labors. But when what is generally known as worry steps in to complicate matters, when cares connected with family arrangements or with those numerous personal details which we can seldom escape intervenes, or when the daily occupation of life is in itself a fertile source of anxiety, then we find one or the other of these three safeguards broken down. Probably the man of business or the successful lawyer fails to shake himself free from his

anxieties at night, and slumber becomes fitful or disturbed. The nervous system, unsettled by the mental strain, brings about various defects in nutrition, and then we meet that depression which is the chief misery of the overworked.

CARE OF THE EYES. — It is well settled that the eyes are benefited by an amount of systematic use which preserves the tone of their muscles and the regularity of their blood supply. Acuteness of sight is aided by the attention bestowed upon objects within the range of vision. In people who cannot read the sight is far from acute. The wives of such men are often indebted to their household needlework for the maintenance of a higher standard of vision than that of their husbands. Idleness of the eyes, if one may use such an expression, is in every way hurtful to them, and proper and varied employment is eminently conducive to their preservation and efficiency.

HOUSEHOLD HINTS.

THE REMOVAL OF GREASE SPOTS. — Fatty oils have a greater surface tension than oil of turpentine, benzole, or other oils. Hence, if a grease spot on a piece of cloth be moistened on the reverse side with one of these solvents, the tension on the greasy side is larger, and therefore the mixture of benzole and fat or grease will tend to move toward the main grease spot. If we were to moisten the centre of this spot with benzole, we should not remove it, but drive the grease upon the clean portion of the cloth. It is therefore necessary to distribute the benzole first over a circle surrounding the grease spot, to approach the latter gradually, at the same time having blotting paper in contact with the spot to absorb the fat immediately.

WASHING MIXTURE. — A correspondent of *The Country Gentleman* says: "I send you a recipe for a washing preparation that I have used in my family for some time, and find very valuable, as it saves time and labor, and does not injure the clothes in any way, but keeps them of a clean and beautiful color. To make 15 pounds of the soap, take 7 pounds of firm, tough soap (home-made hard soap will answer), cut into thin slices, 2 pounds of sal soda, and 1 pound of unslacked lime. Put the lime and soda into a dish, pour over it two gallons of boiling soft water, stir it well, and let it settle. Pour off the clear water into a dish containing the soap; put it on the fire, and let it remain there until the soap is dissolved. Dissolve 1 ounce of alum and 2 ounces of borax, and put them into the soap as it is taken from the fire. Let the soap cool a little, and then add 1 ounce of benzine. When the soap is perfectly cool it can be cut into bars. Soak the clothes over night. Cut 1 pound of this soap into 7 gallons of water, put the clothes in, and boil without rubbing. Wash them enough after boiling to get the soap out, and rinse thoroughly. Use the same water for second boil."

TO WASH LACE. — A Canada correspondent gives the following method: Mix a teaspoonful of powdered borax in a basin of strong white Castile soapsuds. Baste the lace to be washed very carefully with fine thread upon two thicknesses of flannel. Soak the lace thus arranged in the suds mixture twenty-four hours, or longer if very dirty, changing the suds two or three times. Then let it lie a couple of hours in clean water to rinse, changing the water once. Squeeze it out (do not wring it), and when partly dry place the flannel, with the lace on it, lace downward, on two thicknesses of dry flannel laid on a table, and smooth it with a hot iron. When the lace is quite dry rip it off. It is considerable trouble, but the lace looks beautiful.

SUMMER PICKLES. — An exchange gives the following hint to housekeepers whose stock of home-made pickles may give out before the "new crop" comes in: "If cabbage can be procured, a really good pickle can be made with it. Here are two rules: Slice and boil until tender three heads of cabbage, as for coldslaw; add a little salt and vinegar to the water in which they are to be boiled. When done take out and spread on plates, and drain off the vinegar and water. Then put in a jar, and pour warm, fresh vinegar over. Sweeten to taste; celery seed and mustard are good to season with. For the other kind of pickle select a nice firm head of cabbage. After removing the outside leaves, and inspecting it carefully to see that there are no worms or bugs, shave it very fine, and put it in a jar. Sprinkle salt and pepper over it, and spices if you choose; a red pepper sliced and put in is good. Pour over it enough cold vinegar to cover it. This will be ready for use in about three days."

DYEING BLACK. — Four ounces copperas and one ounce logwood extract to each pound of goods; dissolve the copperas in water sufficient to cover the cloth; wet it in clean water before putting it in copperas water, to prevent spotting; boil it in the copperas water about 20 minutes; take it out, rinse in clear water first, then wash in soap-suds till it seems soft as before it was put in the copperas water; then put into the logwood dye and let it boil about 20 minutes; take out, and let it dry; wash before it dries, or after, as is most convenient. It will neither crock, fade, nor grow rusty.

TO RESTORE BLACK MERINO. — Soak the goods in strong soft-soap suds two hours; then, having dissolved one ounce of extract logwood (which is the amount required for one dress) in a bowl of warm water, add sufficient warm — not hot — water to cover the goods, which are to be taken from the suds without wringing. Allow the goods to stand in the logwood water over night; in the morning rinse in several waters without wringing; in the last water add one pint of sweet milk, which stiffens the goods a little; iron while quite damp. They will not crock, and look like new.

CLEANSING SILVER-WARE. — Dr. B. F. Davenport recommends the use of hyposulphite of soda for cleansing tarnished silver-ware. A saturated solution is employed, applied by a cloth or brush. It is well to preserve the salt in a dry state, as the solution decomposes readily.

KEROSENE FOR WARTS. — It is said that common kerosene placed on warts will remove them in a couple of weeks. It should be applied twice a day, and if the surface of the wart is hard and dry it should be scratched to promote the absorption of the oil. No scar is left after the cure.

Practical Chemistry and the Arts.

SPENCE'S METAL AND ZEIODOLITH.

NEARLY two years ago an Englishman named Spence noticed that when metallic sulphides were mixed with melted sulphur they seemed to combine and form a homogeneous mass. On account of its low melting point and the property of expanding on cooling, it was particularly well adapted for making casts and connecting gas and water pipes, and being able to resist the action of acids would take the place of lead. It soon became a commercial article in England, but we hear little of it in this country. A moment's consideration will show us that its *remarkable* properties differ very little from those of sulphur. In color it resembles cast iron; its melting point (255° F.) is a little higher than that of sulphur; its specific gravity is from 3 to 3.5, that of sulphur only 2.

We need hardly add that it is neither a metal nor a chemical compound. It might more properly be called "adulterated sulphur." Glassenapp analyzed a piece of the commercial metal and found it contained, —

Sulphur	64.47
Iron	26.68
Copper	0.59
Antimony	trace
Sand	5.79
Carbonaceous matter	1.92
	99.45

Under the microscope he detected particles of pyrites and stone coal.

The compound was evidently made by melting one part of sulphur, and stirring in two parts of finely divided iron pyrites, containing some gangue. It melted at 230° F.

Zeiodolith is the name given to another similar substance, made by mixing melted sulphur with powdered glass, fine sand, or powdered granite, and is probably more permanent than Spence's metal.

Both of these substances possess certain advantages over pure sulphur: they are cheaper, do not burn so readily, and the tendency of the sulphur to crystallize on cooling is destroyed. For some purposes, too, the color may be preferable.

BLUE PRINTS.

AN improved method of making cyanotypes, which gives a blue picture with a pure white ground, is described by Eder.

Well-sized paper is painted over with a brush with the following solution, freshly prepared: 30 volumes of gum Arabic solution (1 to 5), 8 volumes solution of citrate of iron and ammonia (1 to 2), 5 volumes solution of perchloride of iron (1 to 2). The mixture appears limpid at first, but soon grows thicker.

The paper is dried in the dark, then exposed for a few minutes under a negative or drawing, and developed with a solution of one part ferrocyanide of potassium in 5 parts of water applied with a brush. It is fixed with dilute hydrochloric acid, 1 to 10, washed thoroughly, and dried.

INDUSTRIAL MEMORANDA.

PREPARATION OF A CLEAR SOLUTION OF CAOUTCHOUC. — Dr. Eder and V. Tóth give the following directions: Inclose 30 grams of finely cut caoutchouc in a capacious linen bag, and suspend this within a flask containing 1 liter of benzine by means of a thread held fast by the stopper, so that the bag remains near the surface of the liquid. In the course of 6 or 8 days the soluble portion of the caoutchouc, about 40 to 60%, will pass into the benzine, while the contents of the bag will swell to an enormous size. The clear limpid solution, which is quite viscous and contains 1.2 to 1.5% of caoutchouc, is then carefully separated. The swelled contents of the bag retain $\frac{1}{4}$ to $\frac{1}{3}$ of the benzine used, and may be utilized for the preparation of an inferior grade of caoutchouc varnish.

The authors also state that a solution of caoutchouc in benzine, kept in half-full bottles, is decomposed on exposure to light, which may be seen by the change of the solution from a viscous to a thin fluid-condition. Even in the dark this change goes on, but it requires about three times as much time.

ICE IN THE DISTILLATION OF ALCOHOL. — M. Raoul Pictet, of Geneva, so well known for his discoveries in the liquefaction of gases, announces a method of distilling alcohol by ice. Two kilograms of ice are needed for the production of a liter of alcohol; that is, for the distillation of one hundred and ten gallons of alcohol a little less than a ton of

ice will be required. The cost of production will include only the coal for working the steam-engine which drives the air-pump, and the sulphuric acid, the evaporation of which produces the ice. M. Pictet declares that this will notably diminish the expense of distillation.

THE BRUSH LIGHT AT THE LONDON POST-OFFICE. — *The English Mechanic* says: "The electric light at the post-office, St. Martin's-le-Grand, has pleased the authorities, and is welcomed by the sorters. A large room, in which there are usually 400 to 500 persons at work, is well illuminated by sixteen Brush lamps, replacing 400 gas-burners; and the temperature of the atmosphere, which was often up to 85° F., and higher, has been reduced to about 70°, an improvement that is highly appreciated by the workers."

A RAILWAY ACROSS AUSTRALIA. — A movement is on foot for constructing a railway across Australia, but the difficulty is the arid nature of the centre of that large island. There are good reasons, however, for believing that, at all events, sufficient water is to be had by sinking wells; for, although there is none visible, it is a fact that gum-trees flourish, and there is abundance of scrub which must obtain water somehow. It is known that the underlying rock is an almost level bed of sandstone, which is believed to be saturated with water; for rivers are known which lose themselves in the waterless plain, and never reach the sea.

METALLIC BELT. — An inventor in Hartford, Conn., has patented a belt which is made of iron wire, the selvages being brass and copper. The weft is of cotton, several threads being woven in without being twisted together. A double fabric is made, between which, or inside of which, a number of single heavier wires are inclosed to take the tensile strain of the belt.

A BERLIN LOCOMOTIVE FACTORY. — The works of Börsig, of Berlin, for construction of locomotives, employ at present 3000 workmen, and turn out 200 to 250 engines annually. The first locomotive was made in 1842. In 1846, Börsig completed his 100th locomotive, in 1854 his 500th, and in 1858 his 1000th.

A NEW CELLULOID. — This new product is said to be obtained from well-peeled potatoes, which are treated for 36 hours with a solution of 8 parts of sulphuric acid in 100 parts of water. The mass is dried between blotting paper, and then pressed. It is further stated that in France smoking-pipes are manufactured out of this new material which are quite equal in appearance to the meerschaum. By heavy pressure the material acquires such a hardness that billiard balls can be manufactured from it.

AN ELECTRIC TRICYCLE. — A tricycle driven by electricity appeared lately in one of the streets of Paris. M. Trouvé writes of it to *La Nature*, stating that the tricycle was of English make, and very heavy (55 kilo.), and that he had adapted to it two of his small electric motors, fed by three secondary elements or accumulators of electricity. The vehicle, mounted by a friend of his, ran several times along the Rue de Valois as fast, at least, as a good ordinary cab. The total weight of the vehicle, with its rider, was about 160 kilograms, and the effective force produced by the two motors was 7 kilogrammeters. The experiment lasted an hour and a half. In view of the results, M. Trouvé has set about the construction of a motor which will produce as much as the two others, so as to obtain a greater velocity, say 20 to 30 kilometers an hour.

CUTTING HOLES IN GLASS. — The firm of Richter & Co., in Chemnitz, have found a way of so impregnating thin German silver discs (15 to 25 mm. diameter) with diamond that when fitted to a quickly-rotating tool these cut through glass or porcelain in a few seconds, or effect any desired carving with great accuracy. With cylinders made on the same principle, round holes can be quickly and exactly made. The wear of the implement, even after much use, is hardly perceptible.

ANALYTICAL NOTES.

TEST FOR TARTARIC ACID. — To a solution of tartaric acid, or an alkaline tartrate, Fenton adds a small quantity of an iron salt, then a few drops of peroxide of hydrogen, and finally an excess of caustic soda. A beautiful violet color results, which is destroyed by chlorine or hypochlorites. Chlorine water may, however, be employed instead of peroxide of hydrogen, if care is taken to avoid any excess.

NITRIC ACID IN WATER. — Williams reduces the nitric acid to ammonia by the use of zinc which has been covered with a film of copper by immersion in a dilute solution of sulphate of copper. The temperature is maintained at 30° C. or higher, and the presence of neutral salts aids the operation. The ammonia is subsequently determined by Nessler's solution.

DELICATE TEST FOR CAUSTIC ALKALIES. — Bachmeyer recommends a solution of tannin, which is colored red or reddish-brown by the slightest trace of caustic alkali. In a short time the reddish color passes into a dirty green.

NITROUS ACID IN WATER. — Griess's test is so delicate as to detect one part in 1,000,000,000 of water. The water is acidified, and some sulphanilic acid with some hydrochlorate of naphthylamine added. If nitrous acid is present a rose-red tint is developed.

ALBUMEN IN URINE. — Bodecker adds to the urine a slight excess of acetic acid and then a few drops of a solution of ferrocyanide of potassium. The mixture is now warmed, and the smallest trace of albumen causes a turbidity.

DIRECT SYNTHESIS OF AMMONIA. — Johnson has obtained ammonia by passing a mixture of hydrogen and nitrogen over spongy platinum, both hot and cold. The greatest quantity obtained was 24 milligrams per hour. If the nitrogen was prepared by passing air over hot copper, or if the nitrogen from other sources was heated strongly, no ammonia was obtained. Johnson thinks that nitrogen, like phosphorus, exists in an active and inactive state, the latter produced by heat.

GLUCOSE IN BREAD. — Bernbeck analyzed some bread which had a peculiar taste, and found 4.2 per cent. of glucose and 16.8 of dextrine in it. The wheat from which the flour was made had suffered a kind of malting due to the damp weather in the harvest during the fall of 1880.

DETERMINATION OF CHICORY IN GROUND COFFEE. — M. Prunier weighs out 2 grams, and separates the finer powder by sifting through fine silk. This powder, which, as microscopic examination proves, is composed entirely of pure coffee, is set aside. That which remains on the sieve is macerated with a few grams of water in a test glass. After some hours it is thrown upon a piece of cloth stretched out and is crushed with the fingers. The grains of coffee resist the pressure, whilst those of chicory, reduced to a paste by soaking in water, penetrate into the cloth, and adhere to it. On drying the cloth it is easy to detach the coffee, which, after desiccation at 100° and addition of the fine powder separated at first, gives the weight of pure coffee. The chicory is calculated as loss.

A COLOR REACTION OF OIL OF PEPPERMINT. — A very beautiful reaction of this oil has been observed by M. C. Roucher. It appears that when to acetic acid of 10 degrees' strength about 1-20th of its weight of oil of peppermint is added, and the mixture shaken up, there is developed in half an hour or an hour a beautiful blue color, which increases gradually in intensity. This color becomes also more and more dichroic as its gets darker; it is then pure blue as seen by light transmitted through it, and cinnabar red when seen by reflection. After a while the color passes into green, and then yellow under the influence of light. Menthol does not produce the same curious reaction.

PRACTICAL RECIPES.

INSTANTANEOUS SILVERING MIXTURE. — To coat copper or brass objects with silver without difficulty or loss of time, the following process is given: Mix 3 parts of chloride of silver with 20 parts of powdered cream of tartar and 15 parts of powdered common salt. Moisten a suitable quantity of the mixture with water, and rub it with a piece of blotting paper upon the metallic object, which must be thoroughly clean. The latter is afterwards rubbed with a piece of cotton upon which precipitated chalk is dusted; then washed with water, and polished with a dry cloth.

DRESSING FOR LEATHER. — To three pounds of boiling water add, with continual stirring, a half pound of white wax, an ounce of transparent glue, two ounces of gum senegal, one and a half ounces white soap, and two ounces of brown candy. Finally add two and a half ounces of alcohol, and, after the whole is cooled, three ounces of fine Frankfort black.

TO MAKE MODELLING CLAY. — Knead dry clay with glycerine instead of water, and a mass is obtained which continues moist and plastic for a length of time. This removes one of the greatest inconveniences that is experienced by the modeller.

FREEZING MIXTURE. — The chemical factory of Finzelberg in Andernach manufactures and sells a mixture with the aid of which a temperature of —15 to —30° C. (+ 5° to —22° F.) may be obtained. It is composed of —

Calcium chloride	20 parts.
Magnesium chloride	20 "
Sodium chloride	6 "
Potassium chloride	13 "
Water	41 "

On mixing this salt with an equal volume of snow, the temperature of the mixture is depressed to —15 or —20 C. (+ 5° to —4° F.). With an equal bulk of snow and crushed ice at —5° C. (+ 23° F.), a cold of —30° C. (—22° F.) may be obtained.

Agriculture.

NEW POUDRETTE APPARATUS.

IT is generally admitted that fertilizers should be made only from materials for which no other use can be found, — substances which have already served their purpose in the animal economy, and have become waste products. On the other hand, no substance should actually be allowed to go to waste that contains any of the essential elements of plant food, whether it be phosphoric acid, potash, or nitrogenous matter capable of conversion into ammonia. The utilization, then, of the waste from the abattoirs — as dried blood, offal, refuse portions of hides, hoofs, or horn, as well as of night soil and sewage — becomes an interesting topic to consider.

Some of these, if applied in their crude state, will undergo decomposition too slowly; others are too volatile, and the more valuable constituents escape into the air. In the last named the quantity of water present, the danger of contagious germs, and the unpleasant odors are serious objections. An apparatus invented by Mr. William Plumer for utilizing all kinds of refuse, including night soil and garbage, has been set up in this city. This apparatus we have examined with interest, and as its operations have some novelty it may be worth considering.

The refuse, as it is received at the works, is placed in a large vat, from which it is fed slowly, but continuously, into an iron cylinder, a foot or more in diameter and sixty feet long, furnished with paddles which keep it in motion and present a very large surface for evaporation. This cylinder is heated either by a coil of steam pipe within, or a direct fire without. The water being mostly evaporated during the time required for it to traverse a distance of sixty feet, the material is discharged as a dry powder, almost without odor, at the other end of the cylinder. It is expected that the heat will be sufficient to destroy any organisms or bacteria that might be present. The apparatus, in operation at the time of our visit, was heated by steam under 75 pounds' pressure, which has a temperature of about 300° F.

It is of course necessary to condense the water which has been evaporated, and as a very large quantity of cold water would be required, the inventor employs an ingenious condenser, in which the evaporation of some volatile liquid, either sulphur dioxide, gasoline, cymogene, or rhigolene, can be used to lower the temperature, as is done in some ice machines. The gasoline or other liquid which has been vaporized in this condenser is condensed in the next one and used over again.

The gases are now forced through dilute sulphuric acid, which absorbs the ammonia; then through a solution of sulphate of iron to remove the other deleterious gases; and what remains is passed through the fires under the boiler, if necessary.

Two questions now arise: What is the value of the fertilizer thus produced, and what will it cost to make it? The first can best be answered by experiment. Analyses show that the ash of human excrement contains from 6 to 18 per cent. of potash, 21 to 26 of lime, 30 to 36 of phosphoric acid, and about 8 per cent. of sand. This is a much smaller quantity of sand and far greater amount of phosphoric acid than is found in the excrement of cattle and horses. Actual experiments with these substances do not show correspondingly favorable results. If, however, the sulphate of ammonia collected during the operation be mixed with the poudrette formed, it will probably possess considerable value as a fertilizer.

As to the cost of making such fertilizers, we have in the first place to remember that the material, if night soil is used, costs nothing. The expense then consists, after the plant is once erected, in labor, fuel, and water. The first item will be small. The inventor believes that with a ton of coal he can evaporate seven or eight tons of water. Assuming the material to consist of one eighth solid and seven eighths liquid, the production of a ton of fertilizer requires the consumption of a ton of coal. But the condensation of seven tons of steam requires the use of at least six times this quantity of cold water, and water in a city is an expensive article. To save this expense, Mr. Plumer uses volatile liquids; but we cannot see why it will not cost as much to recondense the gasoline used in condensing a ton of steam as it would to condense the steam itself. There are other practical questions that present themselves, but they will be left for others to consider.

HOW PLANTS GET THEIR NITROGEN.

A CORRESPONDENT of the London *Agricultural Gazette* recently quoted approvingly some of M. Ville's notions concerning the supply of nitrogen to plants. This has drawn forth a criticism from Dr. Lawes, the following extract from which is interesting and suggestive: —

M. Ville says that some crops, beets, colza, etc., require a certain amount of nitrogen to be supplied in manure in order to start them into active growth, after which they can derive their supplies from the atmosphere.

If we wished to ascertain the accuracy of such a statement, how should we go to work? Should we not grow a root crop for a good many years in succession, first with a mineral manure, then with the same minerals with a small amount of nitrogen added, and again with a much larger amount of nitrogen?

In 1856 and up to the present time we have had experiments going on which appear to be exceedingly well adapted to show whether a mangel crop supplied with abundance of minerals and but little ammonia can obtain a further supply from the atmosphere. In the following table will be found the average produce of mangels for the last five years, grown by means of a manure consisting of sulphate of potash and superphosphate; by the same minerals with the addition of 35½ lbs. per acre of a mixture of equal parts of sulphate and muriate of ammonia; in another experiment 400 lbs. of salts of ammonia were applied, and in the fourth experiment 435½ lbs. were used. Mean of four years, 1877–1880: —

	Bulbs per acre. Tons.	Cwt.
Minerals only	4	10
With 35½ lbs. salts of ammonia	6	0
With 400 lbs. salts of ammonia	14	0
With 435½ lbs. salts of ammonia	14	13

The increase of mangels obtained by means of the 35½ lbs. of salts of ammonia added to the minerals was 1½ ton, and the amount of nitrogen they would contain would be nearly 7 lbs., about equal to the quantity supplied in the manures. When 400 lbs. of salts of ammonia were used, the amount of nitrogen in the crop was considerably less than that supplied in the manure; and it will be observed that an additional 35½ lbs. of salts of ammonia only added 13 cwt. to the crop.

The conclusion I am disposed to draw from these experiments is: (1) that mangels supplied with abundance of mineral and with small quantities of nitrogen do not obtain a further supply from the atmosphere; (2) that when mangels are grown by means of manure containing large quantities of nitrogen, a considerable amount is not recovered in the crop, and the larger the amount applied the more proportionally will be the amount lost.

FARM HYGIENE.

IN a communication to the *Sanitary News*, Dr. Reed divides the preventable causes of disease peculiar to farmers into two classes, namely:

I. Causes having their existence in defective hygiene of the person: such as resuming labors too soon after meals, and insufficient attention paid to bathing.

II. Causes having their existence in defective hygiene of the surroundings, such as the disposal of the kitchen drainage, unclean cellars and untrapped drains, too many trees around the house, and location on a malarious site.

These few points suggest a wide field of thought for the intelligent farmer.

FOR THE FARM AND GARDEN.

COAL TAR IN PRUNING TREES. — Efforts have been made to discover some method of covering the wounds inflicted on trees, either accidentally or by the hands of man. The remedy usually recommended from time immemorial is the ointment of St. Fiacre, a mixture of loam and cow dung. Various preparations, too, used in grafting, and having rosin, wax, and grease as their basis, have at different times been very generally recommended for this purpose. These preparations are expensive; and as they must be applied hot it is not practicable to use them on a large scale. Their use, too, is attended with serious difficulties. As the new growth of wood spreads over the wound, these thick coatings are either broken or pushed aside bodily, according to the power of resistance of the material used; and the wood is again exposed, and a safe retreat for injurious insects prepared.

One coat of coal-tar is sufficient for wounds of ordinary size; but when they are exceptionally large, a second coat may, after a few years, be well applied. In warm countries, like the South of France, the great heat of summer renders coal-tar so liquid that it is often impossible to treat properly wounds made at that season. In such cases another coat should be applied during the following winter.

HOW TO TAKE CARE OF HARNESSES. — A harness that has been upon a horse's back several hours in hot or rainy weather becomes wet; if not properly cleaned, the damage to the leather is irreparable. If, after being taken from the horse in this condition, it is hung up in a careless manner, traces and reins twisted into knots, and the saddle and bridle hung askew, the leather when dried retains the shape given it while wet, and when forced to its original form damage is done the stitching and the leather. The first point to be observed is to keep the leather soft and pliable. This can be done only by keeping it well charged with oil and grease; water is a destroyer of these, but mud and the saline moisture from the animal are even more destructive. Mud, in drying, absorbs the grease and opens the pores of the leather, making it a prey to water, while the salty character of the perspiration from the animal injures the leather, stitching, and mountings. It therefore follows that, to preserve a harness, the straps should be washed and oiled whenever it has been moistened by sweat or soiled by mud. If a harness is thoroughly cleaned twice a year, and when unduly exposed treated as we have recommended, the leather will retain its softness and strength for many years.

A VALUABLE INSECTICIDE. — Professor A. J. Cook, of the Michigan Agricultural College, has been experimenting on the efficacy of the pyrethrum powder for the destruction of the cabbage worm and other insects injurious to vegetation. The experiments showed conclusively that the powder, whether applied with water or in a mixture with flour, was fatal to the caterpillars. This powder has only to be sprinkled upon the plants, but two applications may sometimes be necessary. The success was better with the liquid than with a flour mixture, and the application more speedy and economical. Even so diluted a mixture as 1-200th of a pound of the powder to a gallon of water was enough to kill eleven out of fifteen larvæ. The aphides on a twig of alder were killed by being dipped into the liquid mixture. All the flies and mosquitoes in a room were thrown to the floor by the effect of blowing a little of the powder into it. Squash bugs, however, seemed able to resist the strongest applications.

TO GET RID OF RATS. — A writer in one of our exchanges says, "We clear our premises of this detestable vermin by making whitewash yellow with copperas, and covering the stones and rafters in the cellar with a thick coat of it. In every crevice

where a rat might tread we put the crystals of the copperas, and scatter the same in the corners of the floor. The result was a perfect stampede of rats and mice. Since that time not a squeak of either rats or mice has been heard about the house. Every spring a coat of the same yellow wash is given to the cellar as a purifier, as well as a rat exterminator, and no typhoid, dysentery, or fever attacks the family."

HOOF CLIPPINGS AS A FERTILIZER. — Some years ago a correspondent of the JOURNAL gave the results of his experience in the use of horn and hoof clippings as a fertilizer for greenhouse plants, and his testimony to their value for this purpose has since been confirmed by others. A recent writer says on the same subject: "A barrel of shavings cut from the hoofs of horses contains more ammonia than a load of stable manure. Applied to land without preparation, they might give no immediate results, but they would become decomposed in time, and crops of all kinds would derive benefit from them. They may be so treated that they would produce immediate results. By covering them with fresh horse manure they will decompose very rapidly. They may also be leached in a barrel, and the water that covered them drawn off and applied to plants. Water in which pieces of horns and hoofs have been soaked is an excellent manure for plants that require forcing. It stimulates the growth of tomatoes, rose bushes, and house plants very rapidly, and emits no offensive odors. In towns a vast amount of fertilizing material is wasted that farmers could obtain the benefit of with very little trouble."

CARROTS VERSUS CABBAGE WORMS. — A writer in the *Prairie Farmer* says: "We had a large bed of carrots, in which the failure of seed left occasional vacancies. These were filled up with cabbage plants. In the garden the worms were picked several times, besides treating them to salt and pepper and such condiments, but to no avail. The worms took the cabbage. In the carrot bed the worms were picked from the cabbage once while the carrots were small; after that the cabbage grew without molestation, and ripened without a sign of a worm upon them. Just outside the carrots were a few cabbages, which were entirely destroyed by worms, while among the carrots not a leaf was punctured. These are the facts, and we have no carrot seed to sell. We raised a fine crop of carrots, which are appreciated for spring feeding, and saved our cabbage. We shall try it again this year as an experiment; last year it was an accident, which gave such good results that we have confidence in it. Our theory is that the strong odor of the carrot is offensive to the insect that makes the mischief."

GLEANINGS.

CHANGES IN THE DIAMETER OF TRUNKS OF TREES. — Messrs. Kraus and Kaiser have been making some researches, from which it appears that the trunks of trees undergo daily changes in diameter. From early morning till early afternoon there is a regular diminution till the minimum is reached, when the process is reversed, and the maximum diameter attained at the time of twilight; then again comes a diminution, to be succeeded by an increase about dawn, — an increase more marked than that in the evening. The variations in diameter coincide, therefore, with those of the tension, but they are shown to be inverse to the temperature, the maximum of the one corresponding roughly to the minimum of the other, and so on.

THE LILY OF THE VALLEY OF SCRIPTURE. — The London *Garden* says: According to the best authorities, this was the purple iris, the "fleur de lys," a plant ever considered sacred to the Virgin Mary. Most amongst us, however, from childhood have erroneously associated the Bible reference to the flower that toileth not and spinneth not with the Convallaria majalis, our lily of the valley or May lily, one of the most fragrant and characteristic of the flowers of the month, but which, indeed, is rather an alpine than a valley plant, naturally growing under the shade of the woods which clothe the flanks of the great mountains. The early tradition attached to the purple iris has been transferred in this country to this, our lily of the valley, whose flowers are said to be "Virgin's tears."

HOW RAISINS ARE MADE IN CALIFORNIA. — In Mr. Blower's vineyard, Yolo County, the grapes are allowed to remain on the vine until of a golden color and translucent. They are then picked, and put on wooden trays two by three feet in size, placed between the rows, sloping to the sun. When half dried they are turned by putting a tray on top, and by inverting them both are transferred to the new tray. When the new grapes lose their ashy appearance, and after removing the green ones, the rest are put into large sweat-boxes, placing sheets of paper between every twenty-five pounds of raisins. They are left there for two weeks, when the stems are tough and the raisins soft. The packing follows, in which iron or steel packing frames are used, the raisins being assorted, weighed, inspected, and made presentable.

A NEW MARKET FOR FLORIDA ORANGES. — The *Pall Mall Gazette* says: A new field of enterprise has been opened by the indefatigable American, in which he comes in contact with no English rivals. We are promised a large importation of oranges from Florida, which, it is asserted, are so much superior to those of Spain and Portugal that they will speedily monopolize the market. A trial box of Florida oranges, despatched from Jacksonville, Fla., to this city, arrived in prime condition after a journey of three weeks. Only three oranges were damaged on the way. The experiment is likely to be repeated on a larger scale, and before long it is quite possible a thriving fruit trade may spring up between England and the Southern States. The supply of oranges in Florida is almost inexhaustible; their quality is said to be much finer than those from the Mediterranean, and if once the trade was established the time of transit would be materially reduced.

CULTIVATION OF PYRETHRUM. — The raising of pyrethrum, of which "insect powder" is made, is extending not only in California, but in various parts of the country. Its use may be enlarged a hundred fold if it proves a reliable destroyer of the cotton-worm, as well as other equally injurious insects, as it is said to do remarkably well wherever it has been cultivated.

ANTS IN ORCHARDS. — Many of the leading orchard proprietors in Northern Italy and Southern Germany are cultivators of the common black ant, an insect they hold in high esteem as the fruit-grower's best friend. They establish ant hills in their orchards, and leave the police service of their fruit trees entirely to the tiny colonists, which pass all their time in climbing up the stems of the fruit trees, cleansing their boughs and leaves of malefactors, mature as well as embryotic, and descending laden with spoils to the ground, where they comfortably consume or prudently store away their booty. They never meddle with sound fruit, but invade only such apples, pears, and plums as have already been penetrated by the canker, which they remorselessly pursue to its fastnesses within the very heart of the fruit. Nowhere are apple and pear trees so free from blight and destructive insects as in the immediate neighborhood of a large ant hill five or six years old. The favorite food of ants would appear to be the larvæ and pupæ of those creatures which spend the whole of their brief existence in devouring the tender shoots and juvenile leaves of fruit trees.

Boston Journal of Chemistry.

JAS. R. NICHOLS, M. D., *Editor.*
WM. J. ROLFE, A. M., *Associate Editor.*

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STORING ELECTRICAL ENERGY.

ONE of the most astounding results of research in electrical science is the discovery of methods of storing up electrical force, and making it transportable and available at long distances from batteries and dynamo machines. This is a discovery of M. Faure, a French electrician, who recently sent to Sir William Thompson, of England, a *package* of electricity for experiment.

Dr. Paget Higgs, of New York, claims to have made some improvements upon Faure's methods of producing light from stored electricity. Some experiments were made a few weeks ago in New York at Dr. Higgs's office, which were exceedingly interesting.

The following is from a city journal published at the time: —

Dr. Higgs says he can store within the space occupied by an ordinary walking-stick the energy required to supply an electric lantern to guide the traveler on his way of a murky night, or transform the baton of the policeman into a marvel carrying a secondary battery at one end and an electric lamp at the other.

When he came to apply this invention to the storage of electricity for the operation of lamps, he was confronted with the grave difficulty that the discharge was not uniform, and was very rapid, unless a considerable proportion of the energy was consumed by interposing an artificial resistance. Bubbles of gas are formed in the Faure battery in such number as to produce pressure, and finally to break the sealing. This trouble, however, was overcome. Dr. Higgs produced small cells of the power of 3.1 volts each, which discharge their energy with the uniformity of the best batteries. His next procedure was to devise a lamp which could be operated by such charged cells without employing any generator or steam-power, thus reducing the problem of lighting a parlor or library with electricity to the simplest possible terms by dispensing with these expensive items. For this purpose he experimented for many months with the incandescent principle, which he finally demonstrated to be impracticable, owing to the high resistance of the solid carbon or metal, as compared with that of the carbon vapor formed between the two poles. He ultimately fixed upon a novel arrangement which he styles the infinitesimal arc; that is, the distance between the two poles of the lamp is so minute as to be scarcely perceptible to the unaided senses, thus offering the least resistance compatible with the generation of a high temperature and the formation of a brilliant light by the incandescence of particles of carbon. In this manner he constructed a lamp of forty candles that could be operated by secondary piles of an energy equal to that of seven or eight Bunsen pint cells. The novel feature of the system thus consists in the application of stored electricity to the production of light, so that a gentleman wishing to light his house or his library by means of that agent has only to buy the lamps and cells required for the purpose. The materials composing the latter are very inexpensive, and the first cost of the plant for domestic purposes is thus reduced to a minimum. No engine is required, no engineer, no generator. The cells may be recharged for a trifle when their energy is exhausted, or renewed for a trifle when they are no longer serviceable, and the lamps are simple in their construction.

We do not endorse all that Dr. Higgs claims, and indeed we have not the fullest confidence in the man, but what he has to show is interesting.

THE CENTENNIAL OF THE MASSACHUSETTS MEDICAL SOCIETY.

The Centennial Anniversary of the Massachusetts Medical Society was celebrated with appropriate honor and enthusiasm on the 7th and 8th of June. The daily papers and the weekly journals have been so much ahead of us in reporting the proceedings that only a brief reference to them will be in place here. Our esteemed contemporary, the *Boston Medical and Surgical Journal*, devoted its entire issue of June 9th to celebrating the occasion, giving a large amount of historical matter connected with the society, a silhouette portrait of its first president, Dr. E. A. Holyoke, and fac-similes of several interesting documents relating to its foundation and its early days. The centennial address by Dr. Samuel A. Green, of this city, was delivered on the 7th, in the Sanders Theatre, at Cambridge, after which the members of the society lunched with the president and fellows of Harvard College, in Memorial Hall. On the 8th, the society had its annual dinner in the Music Hall, in Boston.

Of the other festivities, excursions, etc., connected with the anniversary we shall not attempt even the briefest mention; but we cannot refrain from adding a slight tribute of praise for the elegant exhibition of pharmaceutical preparations, drugs, surgical instruments, etc., at Horticultural Hall and the Tremont Temple Chapel. Among the notable features were the contribution of Harvard University, including a cabinet of drugs, an herbarium of preserved medicinal plants, specimens of the living plants in pots, etc.; the specimens of materia medica, etc., from the Massachusetts College of Pharmacy; the curious collection of old pharmacopœias and dispensatories, by Mr. S. A. D. Sheppard, of this city; and the display of pharmaceutical and kindred preparations by leading manufacturers in Boston, New York, Philadelphia, Detroit, and other cities. The exhibition was highly creditable to those who got it up, and was fully appreciated by the members of the society and all who had the privilege of seeing it.

THE LARGEST REFRACTING TELESCOPE IN THE WORLD.

For the present our friend Alvan Clark is outdone by his Hibernian rival, Howard Grubb. The 26-inch refractor at Washington, the largest previously made, must yield the palm to the 27-inch one lately finished at Dublin for the Royal Observatory at Vienna.

It is a curious fact that the Emerald Isle should have produced the largest refractor as well as the largest reflector, which our readers are aware is Lord Rosse's. The former was ordered by the Austrian Government in 1875, and the mechanical portions of the instrument were nearly finished in 1878. The making of the object-glass was delayed by the difficulty of getting perfect material. Messrs. Feil, of Paris, furnished several sets of glass disks for the purpose before any were found free from flaws and defects. Much time and labor were lost in working some of these disks into such shape that their imperfections could be detected. It was not until March of the present year that the instrument was complete in all respects, and its performance approved by the commissioners appointed by the Austrian Government to test it.

The tube of the telescope is made of steel plates riveted together, and measures 33½ feet in length, with a diameter of 36½ inches in the middle, tapering to 27 inches at one end and 12 at the other. The weight of the tube with its attachments is between six and seven tons, but the whole weight can be easily moved by the observer with one hand. The great dome in which the telescope is to be placed is also of steel, consisting of a double shell of thin plates with light ribs and girders between, the whole forming a cellular structure somewhat like that of the top and bottom of the Britannia Tubular Bridge. Great strength and stiffness are thus oecured, while the weight is reduced to the minimum. The dome, 45 feet in diameter, weighs only about fifteen tons, and when set up on temporary supports at Dublin could be moved round with a tractive force of seventy pounds. It will probably "work" even more easily in its proper position at Vienna.

Let our Irish and Austrian friends boast of their big telescope while they may, for in the course of a few years they will probably have to restore the "championship" in this line to us Yankees. When Alvan Clark makes a glass of 30 inches or more for the Lick Observatory in California, it will "lick all creation," and we shall see whether Mr. Grubb or any other Hibernian or European can again "win the belt."

DISEASED MEAT AS FOOD.

We are permitted to copy the following extract from a letter written to a friend in this country from Northern India by Rev. Dr. Marcus N. Carleton, a missionary twenty-five years resident in that country. The statements made are certainly very remarkable, but doubtless truthful. The matter is one which cannot fail to attract attention among physicians and the guardians of health everywhere:—

"In India for at least twenty-five hundred years we have had a class of village 'Kamius' (low caste), called *Chumars*. I seldom, if ever, saw a village so small as not to have at least one family of Chumars in it, and some towns have three hundred families. These people are tanners and shoemakers. Under ancient as well as modern Hindoo rule, and under English rule, they have a *legal status* and a legal right to all dead cattle.

"These people, the Chumars, are a large and thriving class, and eat all dead cattle, dying from whatever disease. The Hissar district is nearly as large as one half the State of Massachusetts. It is a great cattle-growing district, and a very large Chumar population is found in it. About twenty-two years ago Dr. Adam Taylor, a distinguished English surgeon, was in charge of the district, and from his lips I heard the following statement:—

"A fatal epidemic broke out in the district among the cattle. Dr. Taylor, by repeated post-mortem examinations, declared that the disease, as far as he could discover, was like a form of typhus often called putrid fever in the human subject. The epidemic raged for months, till forty thousand head of cattle perished; and all these dead bodies were eaten by law, by legal right, by the Chumar population. After the epidemic was over, and these forty thousand head of cattle had all been eaten, Dr. Taylor made a careful examination of the Chumar population, and he could find no traces of any disease among them caused by eating the dead cattle, but on the whole they were more healthy than any other class of villagers.

"During the last twenty-five years I have examined nearly fifty such cases. I will mention one. In the Hindoo village of Kamius there were twenty-two hundred head of cattle. An epidemic broke out among them, and in five months about six hundred of them died. In this village there are twenty-two families of Chumars, of about eight persons to a family. These families ate in five months about six hundred head of cattle, all dying of a very fatal disease. I visited these Chumars, saw their baskets of meat, saw in every house large earthen pots filled with meat on the fire. I saw little children eighteen months old sucking small bones of this meat, as little New England children would suck the leg of a roast turkey on Thanksgiving day. I visited these families after their generous meat diet, and found them all in as good health as any of the people. I have now lived twenty-five years among the Hindoos, I have been in medical attendance on every class (there are some thirty-six classes), and I do not think that even among the Brahmins, the strictest vegetarians in the world, there is better health than among the Chumars, who for twenty-five hundred years have by law eaten all the cattle of India, dying by whatever disease."

CONCERNING MEXICO.

A subscriber to the Journal in Paso del Norte, Mexico, sends us the following note:—

There is a good deal of the enthusiasm of a newcomer and stranger in the article "Travelling in Mexico" in the last Journal, and I desire to make a few corrections. To think that a country of over 700,000 square miles, with only about five millions of inhabitants, is deficient in hotels and boarding-houses is rather naïve. Stage coaches are not rare, and much of the travel is done by means of them. The richly ornamented trappings spoken of are to be counted among the exceptions; still, some are very fine and ornamental. The ordinary saddle is a rough wooden one and the bridle a rope. Families must of course travel in the style spoken of, as the stage-coaches are generally crowded, and riding in them is very fatiguing. That the gentleman ever had to buy water is surprising, as hospitality is one of the characteristics of the Mexican; so much so that I saw a man pawning his Sunday coat to put a meal before a visitor. Furniture is indeed an unknown luxury; but then some of the best butter I ever ate I found in Mexico. In regard to cheese, I never saw the kind referred to, but an article similar to Holland cheese in size. I would like to be silent about its qualities, having found it to be plentifully supplied with insects and other undesirable ingredients. As to horses, gentlemen here take a special pride in breeding of draught animals, some of them being quite equal to the Percheron. The nature of the country of course makes the mule the more useful and more economical animal.

The "fine" wines of El Paso are manufactured from grapes which sell at about a cent a pound in California. The manufacture of the wine is done in hides, which are strapped between two long poles and two cross-pieces, and which serve at the same time as measures. These wines are stored, as in any other country, in casks and bottles. There is a scarcity of wood in and around El Paso, but the country in general is sufficiently supplied with wood. The erection of a frame house would not be so very costly, but walls of three and four feet in thickness are better suited for protection against the heat.

Unfortunately, most of the publications concerning this part of the country have to be received with

distrust. All that can be said of it is that it is an arid, sandy highland, with some good valleys, which are made habitable only by the rivers, most of which have no claim to that name. The Rio Grande itself is often perfectly dry here in summer, when the little head water is used for irrigation in New Mexico.

METEOROLOG FOR MAY, 1881.

THE sum of my observations on the weather the past month has been as follows, namely : —

Average Thermometer.		Lowest.	Highest.	Range.
At 7 A. M.	55 36°	40°	75°	35°
At 2 P. M.	68.53°	47°	88°	41°
At 9 P. M	57.53°	42°	79°	31°
Whole month	60 48°	40°	88°	48°
Last 18 Mays	56.33°	50 72° in 1867.	64.28° in 1880.	13.56°
Spring months 1881	46.50°	22°	88°	66°
Last 18 springs	43 97°	38.57° in 1864.	49.09° in 1878.	10.52°

The average barometer for the month was 30.001 inches, the lowest 29.68, and the highest 30.32, a range of .64 of an inch. The average for the last nine Mays has been 29.931, for the last eight entire years 29.919, showing a heavier atmosphere in May than through the year; but these observations have not been sufficiently extended to establish such a general fact. The sum of daily variations in May last was 3.20 inches, giving an average movement of .103 of an inch. The average for the last nine Mays has been 3.71, the average daily movement .120. There were no large movements, and fourteen observations were stationary.

The face of the sky in 93 observations gave 39 fair, 7 cloudy, 35 overcast, and 12 rainy, — but little more than three eighths fair; a cloudy, moist month, and yet but 2.90 inches of rain, the average for the past thirteen years being 2.70 inches. The smallest amount was .55 in 1878, and the largest 3.85 in 1873. On the 10th, 18th, and 30th of the month we had sharp lightning with thunder, quite severe on the evening of the 30th. As this shower came up from the north about sunset, there was here a splendid illumination along the northern horizon, a reflection of the sunset in addition to the almost constant flashes of chain lightning.

The direction of the wind at the usual observations gave an excess of only 6 northerly and 3 easterly over the southerly and westerly, indicating an average direction of east 63° 25′ North, or nearly N. N. E. This is the first time since April, 1877, that a month has had more easterly winds than westerly, and the first time since 1869 when the entire winds of the month have come so near balancing. If the current of air had been of uniform velocity through the month in the directions observed, a balloon following that current would have returned nearly to the point of departure, being only one day's motion to the eastward and two days' to the northward of such point.

It will be seen by the above table that the temperature of the past month and spring has been several degrees above the average for eighteen years, though following an unusually severe winter. On the 10th and 11th, and again on the 30th, the heat was quite intense for the season, approaching 90°, and even beyond this in some localities, while between these dates an opposite extreme occurred, some days falling among the forties at noon, with night frosts in certain localities. There was also an unusual amount of cloudy, "dirty" weather, with easterly winds and a full share of moisture, securing luxuriant vegetation, with a fair prospect of abundant fruit, except apples. D. W.

NATICK, *June* 8, 1881.

EDITORIAL NOTES.

IN BEHALF OF THE PUBLISHERS. — We are requested by the publishers of the JOURNAL to call attention to the *bills* which many of our readers will find enclosed with the present number, and to say that a prompt remittance of the amount due will be very acceptable. In regard to the *form* of remittance, see "Special Notice" on page 84.

AN ITALIAN TRIBUTE TO ENGLISH ENGINEERS. — The city of Turin has lately paid a graceful tribute to the English Stephensons. A marble slab has been inserted in the principal front of the railway station, surmounted on each side by two medallions representing George and Robert Stephenson. An inscription on the marble states that Italy, as represented by Turin, desires to honor the illustrious memory of these two brothers, who, by the perfection to which they brought the locomotive engine, opened out a new life for commerce and laid the foundation of a higher fraternity among the nations. The eagle of Savoy and some graceful bronze work incloses the whole. It would be pleasant to see other towns following the large-minded example of Turin in matters of this kind. Towns, and even nations, are too apt to pay homage only to their own children of genius. It is rarely we find those of another country recognized by any public memorial.

ARTFUL AND ARTISTIC. — The French difficulties in Tunis have brought the following little game to light, which has, it is said, been carried on for a long time at Carthage. Four or five cicerones who lounge about the place lead the visitor from one place of interest to another, — from the pretended palace of Neptune, a heap of rubbish, to the pretended Senate House. At a proper moment the guide pokes his cane in a hole, and startles every one by the discovery of a rich old mosaic, which he hastens to sell to the visitor. The mosaic is made in Marseilles, and the investment yields a percentage unheard of even in Wall Street.

AN OILY INUNDATION. — A singular phenomenon recently occurred in Sweetwater County, Wyoming Territory. Last season the Rocky Mountain Oil Company bored in several places in the district, and collected the oil at other spots where it exuded from the ground. They built six or seven reservoirs to contain it, and thus stored two or three thousand barrels, but they have lost part of it through an unforeseen casualty. An ice-gorge formed in Popajie Creek, above two reservoirs holding 1200 barrels. The water poured over and into the reservoirs, and being heavier than the oil displaced it wholly. The sea of oil ran over the meadows for several miles about, blackening them as if a prairie-fire had swept across. The farmers were incensed, but no one could be charged with fault. After the gorge passed out, the water was pumped from the wells, which will soon fill to the brim again.

CONCERNING COUNTRY DOCTORS. — According to a decision of the Massachusetts Supreme Court, a country surgeon is not bound to the exercise of that high degree of art and skill possessed by eminent surgeons living in large cities and making a specialty of the practice of surgery, but only to that reasonable degree of learning, art, and skill ordinarily possessed by others of his profession, having regard to the advanced state of the science.

ATOMS.

ONE of the industries of Australia is the cooking and canning of rabbits, which are so plentiful in some districts that whole crops are sometimes destroyed by them; one firm during the last season, which lasted twenty-five weeks, canned 675,000 of the animals. — Recently a bashful boy in Indiana was called before a grand jury, and closely questioned as to unlawful deeds which he was supposed to know about; he was so badly frightened that the next day he was stricken down with brain fever, which caused his death. — Rule for calculating the pressure of steam on a cylinder boiler at any given number pounds of steam: Multiply the diameter in inches by the length in inches and by the pressure per square inch; the result is the total pressure tending to rupture the boiler. — The persistency with which English writers and printers cling to the use of the vowel *u*, in such words as parlor and favor, was illustrated forcibly not long ago in the Bank of England, where a chancery draft was refused payment, because, in stating that it was in favor of so and so, the drawer had spelt the word "favor" without a *u*. — Finely powdered glass mixed with soluble silicate of soda will be found to make an excellent acid-proof cement. — At the Royal Palace in Berlin, 40,000 wax candles are instantaneously lighted by a single match; the wicks are previously connected by a thread spun from gun cotton, on igniting one end of which all the candles are lighted simultaneously, and thus the whole of the 700 apartments are lighted at once. — A London journal says that the specification of Edison's British patent for his electro-magnetic railroad has been published, and contains seven sheets of drawings and thirty-four claims; the carriage or locomotive is provided with magnets, which exert an attractive force on the rails, and so increase the grip of the driving wheels.

LITERARY NOTES.

WE have received from Walter B. Kilner, Springfield, Ill., a copy of his *Compendium of Modern Pharmacy and Druggists' Formulary*. The author has succeeded in collecting into a convenient volume of 650 pages more than 1500 recipes for elixirs, extracts, pills, syrups, pads, perfumes, and every other unofficinal compound that the pharmacist is likely to want to make. We consider it an invaluable work that should be in the hands of every druggist in the country. The author proposes to keep it up to the times by issuing supplements every ninety days, which are sent free for twelve months to all purchasers.

Dr. Van Nostrand reprints from the last English edition a *Text-Book of Experimental Organic Chemistry* for students, by H. Chapman Jones. The absence of any work whatever on the organic part of experimental chemistry has long been felt, and those who have had the courage to undertake the task of teaching organic chemistry practically have been obliged to extemporize experiments of their own. The little book before us fills the place of laboratory companion for the student admirably. The experiments described serve not only as guide-posts, but also as danger signals, care being taken to warn the student of what he must not do, as well as to tell him what he may do. At the present time, however, we should not expect to see a scientific text-book talking about ounces, inches, and pints, and we hope the next American edition will remedy this only fault, by substituting the decimal system.

Mr. Rolfe's edition of *Coriolanus*, the twenty-third of his series of Shakespeare's plays, has been published by the Harpers since our last number went to press. An exchange says that "the preface alone is worth the cost of the volume." The *Comedy of Errors* will be issued immediately, and *Cymbeline* is all in type. *Antony and Cleopatra*, the next play, is in the hands of the printer, and Mr. Rolfe is now at work on *Measure for Measure*.

We have received from E. H. Evans & Co., St. Louis, Mo., Vol. III. of the *American College Directory and Universal Catalogue*. It contains a full list of schools of all sorts, from the kindergarten to the university; also a list of educational periodicals, among which the BOSTON JOURNAL OF CHEMISTRY is wisely inserted.

We are indebted to Dr. Chas. S. Turnbull, Philadelphia, for a pamphlet on the *Audiphone and Dentiphone*, reprinted from the Archives of Otology, VIII. 4; also for a paper on Diseases of the Middle Ear.

La Gaceta de la Industria y de las Inventiones is the name of a scientific weekly of 16 pages that comes to us from Barcelona, Spain. Terms 25 pesetas per annum.

America is the name of a poorly printed sheet published at the National Capital, which proposes to expose frauds of all sorts without fear or favor. The first number devotes a great deal of space to the adulteration of food and its remedy.

The Manufacturer and Industrial Gazette is a new candidate for popular favor, which comes to us from Springfield, Mass. It is well edited, neatly printed on good paper, and deserves the attention of engineers, machinists, and mechanics generally. The May number contains an excellent paper on Oleomargarine, by J. H. Pillsbury.

The *Heidelberg Monthly Journal* is the title of a small magazine edited by the students of Heidelberg College at Tiffin, Ohio.

Medicine and Pharmacy.

MAKING MEDICINES NEEDLESSLY DISAGREEABLE.

ALL persons who are under the unpleasant necessity of taking medicine in these latter days ought certainly to be grateful to the manufacturing pharmacists for relieving the dose of much of its ancient "nastiness." A great deal has been accomplished in the way of presenting disagreeable drugs in comparatively palatable forms. Many things, indeed, which used to be emphatically "bad to take" have been so disguised in sugar coatings and syrupy vehicles that, in the language of the enthusiastic advertiser, "children cry for them."

It is to be feared, however, that some physicians do not avail themselves so fully as they might of these modern refinements of the prescriber's art. They adhere to the old and disgusting methods, instead of adopting those that are newer and more agreeable for their patients. Dr. W. C. Stillwell shows up some of these merciless practitioners in a recent article in the *Philadelphia Medical Times*. Among the recipes which he quotes from the prescription file of a city druggist is one for "powders of cubebs, alum, and cinnamon, so large that one of them filled twice a tablespoon heaping full, and when mixed in a half glass (four ounces) of water it made a dose that almost any human being would rebel against." He adds that "as two or three drops of the oil of cubebs and one tenth of a drop of that of cinnamon would represent the amount of the respective remedies, a pleasant instead of an offensive compound could readily have been made."

He also quotes "the latest treatment for tapeworm" from a medical journal, which we reprint, with his comments upon it: —

"The patient takes a dose of castor-oil, then milk diet for twenty-four hours, and no other food except a salad of salt herring, onions, and garlic; then he takes a mixture of a decoction of pomegranate-root, ethereal extract of male fern, sulphuric ether, fluid extract of valerian, croton oil, and honey." At this period of the treatment the patient can take more herrings and onions, if he wants them. "As soon as the mixture produces colic, an ounce of castor-oil is administered hourly until the worm is expelled."

If the patient lives through all this, and the worm succeeds in clinging to the mucous coat of the intestines after passing through such an ordeal, it deserves to remain there unmolested the remainder of its existence.

The following is another good illustration of the "nasty" type of prescriptions, and also of the positions sometimes taken by the doctor concerning them: —

A prescription was presented at a drug store to be compounded, not long ago, containing a number of ingredients, among them a preparation of iron and also a vegetable astringent. It was compounded and delivered to the patient; he immediately returned it to the store, with the remark that "he did not want ink." The druggist referred him to the physician who prescribed it; he told the patient that "if he prescribed ink it was his place to take ink." And he did; and when he had any writing to do he would use his medicine as a writing-fluid, and when his inkstand wanted replenishing he would always get his prescription renewed.

Who has not known doctors of this arrogant and unfeeling temper, — mostly old fellows trained in the "heroic" ways of a past generation, — and who would not feel a malicious satisfaction in forcing a few liberal doses of their inky and other abominations down their own throats? If medicines must be disagreeable, let us gulp them down as best we may; but when the nauseous dose can be made more tolerable without detriment to its efficiency, the practitioner should have some regard for his patient's palate as well as his health.

In closing his paper on this subject, Dr. Stillwell gives a practical illustration of what the considerate physician may easily do in this direction: —

I am accustomed to have made up at a drug store a recipe which could be called either a syrup or an elixir; I give it for what it is worth. A half fluidounce of the compound added to a four-ounce mixture containing disagreeable-tasting medicines, such as bromide and iodide of potassium, bichlorate of sodium or potassium, quiniæ sulph., and many others, will cover a multitude of imperfections in a prescription as regards color, taste, etc.

This is the formula: —

℞ Aurantium cortex recens	ʒi.
Sem. anisi (cont.)	ʒij.
Sem. cardam. (cont.)	ʒi.
Sem. fœniculi (cont.)	ʒij.
Coccus cacti (cont.)	ʒi.
Sacch albæ	℥xxxij.
Sp. vini rect.	f℥iv.
Aquæ	Ojss.

Macerate all of the ingredients, except the sugar, in the alcohol and water for four days, filter, and dissolve the sugar by the aid of gentle heat, and strain it while warm.

TREATMENT OF SEA-SICKNESS.

DR. F. D. LENTE, of Saratoga, N. Y., sends to the JOURNAL the following communication on his method of treating that distressing malady, sea-sickness. We have often recommended Dr. Lente's method to friends visiting Europe, and usually the results have been gratifying: —

In the June number of your journal you reproduced an article from the *British Medical Journal*, by Dr. O. G. Wood, on "The Cause and Treatment of Sea-Sickness." As regards the *cause* I shall have little to say, except to indicate my agreement with Dr. Wood and Dr. Beard that it is, primarily at least, a "cerebral phenomenon." Dr. Wood says, "I fear we shall never be able therapeutically to prevent sea-sickness, but I do hope that we may, some day, be able to cure it." I think that those of your readers who have to "go down to the sea in ships" will be interested to know that there *is* a *preventive*, though not a perfect one in all cases. The various cures are even more uncertain than the preventive. I doubt if one out of ten would be able to retain on the stomach the composite prescription which Dr. Wood proposes to try on his "next sea-voyage." When the sickness has become fully developed, most patients have not the fortitude sufficient to take any remedy unless it be of a most agreeable character, like cold dry champagne, perhaps the best of all *remedies;* therefore, in this case, "an ounce of prevention is worth a pound of cure."

On numerous occasions I have spoken of *electricity* as one of the best remedies for reflex or sympathetic vomiting, as that occurring after ovariotomy, in pregnancy, and in *sea-sickness*, often succeeding after the failure of all other remedies. Years ago, I recommended *getting the system under the influence of one of the bromides* as a preventive of the vomiting caused by ether inhalation, and many surgeons have since used it with success. In operations on the eye, when ether is to be used, it is particularly important. Regarding this species of vomiting as a nervous or sympathetic phenomenon analogous to sea-sickness, I tried it as a preventive of the latter, and with a reasonable degree of success. Others have made the experiment, notably Dr. G. M. Beard, also with gratifying success. Dr. Beard has given a tolerably wide publicity to my suggestion in his recent work on "sea-sickness;" but, in your several notices of the treatment of this malady in your valuable journal, you have not alluded to the subject [see JOURNAL for Aug. 1879, p. 94], and I have thought it advisable to call the attention of your readers to it, as it is so safe and simple. The directions given in my last publication, "The Constituents of Climate," 1878, are to take about half a drachm of the bromide of sodium three times a day in a third of a glass of water for three or four days before sailing; this dose may be much increased, doubled, as the time for departure draws nigh, in case the peculiar symptom indicating its effect on the system is not marked, — that is, a pleasant drowsiness in the day-time. This must be felt decidedly before sailing, or the trial is not a fair one. The amount of the *dose* is of little consequence; this *effect* must be produced. The remedy should be continued *after* sailing if the drowsiness does not become troublesome, especially if the sea is rough.

Of course, other precautions should not be neglected. The traveller should avoid fatigue during the days preceding departure, and all excesses, especially of eating or drinking, and during the voyage should follow the same rule, eating very moderately, and keeping on deck as much as possible; entering into amusements and conversation, or reading an interesting book; keeping away from the *extremities* of the ship, and remaining amidship if there is much sea.

THE MOSQUITO AS A CARRIER OF DISEASE.

A CORRESPONDENT inquires whether there is "anything in the newspaper statement that mosquitoes are the agents for introducing dangerous parasites into the human blood." We are pained to be obliged to say that there is good ground for this addition to the disreputable "record" of the insect. The discovery was made a year or more ago, — we cannot give the exact date, — and has since been fully confirmed by further investigation. Dr. Meisoner, of Leipsic, in a German medical magazine, has lately summed up what is known of parasitic infection of the blood, and the following is an abstract of what he says of the *filiaria sanguinis hominis*: —

This parasite has been very thoroughly studied by Manson, of Amoy, China, and Bancroft, of Brisbane, Australia. The filiaria, while it may at times be present in the blood without giving rise to any symptoms, at other times appears beyond question to be the cause of chyluria, elephantiasis, etc. The mode of its action would seem purely mechanical. The parasite lives in the blood or lymph channels and its accumulation at a given point gives rise to lymphorrhagia or inflammation. Two curious facts have recently come to light regarding this parasite. One is that the mosquito acts as a carrier: sucking the filiaria with the blood of an affected person, it afterwards deposits the ova or embryos, which have meantime hatched, in the water when it lays its own eggs. These embryos are then swallowed in the drinking-water by another victim; and so the circle of disease is completed. Another and a very curious fact regarding the habits of the filiaria was lately discovered; this is that it is a nocturnal parasite. During the day the filiariæ lie dormant at some point in the victim's circulation, but at night they sally forth and rove the currents of the blood the night long.

THE SICK PREMIER AND THE EAST WIND.

Dr. Fothergill, in one of his interesting letters to the *Philadelphia Medical Times*, devotes considerable space to the last illness of Lord Beaconsfield. The English east wind, it seems, was too much for the illustrious patient. Compared with that "compound of pepper and icicles," as N. P. Willis called it, which goes by the name of east wind in New England, the British blast, according to our experience of it, is a balmy zephyr; but it appears to be bad enough in native estimation. Dr. Fothergill says: —

"It was curious how the ex-premier's condition varied and oscillated with the weather-cock. When the wind veered from the east and northeast into the west the aged senator picked up; when the wind went round to the east again, he drooped. The temperature of the room might be maintained artificially, the air might be kept moist by bronchitis-kettles, but nevertheless the nor'easter made itself felt. The keen nipping wind found an entrance in spite of everything that acute human intellects could devise, and the venerable Oriental sank under the east wind at last.

"The most useful agent, it appears from the daily press, for giving him relief from his asthmatic paroxysms was 'Himroth's powder,' — not a remedy in the English Pharmacopœia, but an American quack or secret preparation. Anyhow, it appears, it did good; and there was a sense of fitness in a long belief in homœopathy terminating and culminating in a quack preparation. But to revert to the east wind. It certainly exercised a most potent influence upon his lordship; it certainly does exercise a curious malign influence upon the inward processes of nutrition and the metabolism or transformation of albuminoids within the body. Many years ago a patient with acute nephritis was recovering very satisfactorily; the appetite was returning and the strength coming back, when the wind veered to the east, and with it the prospect clouded. Uræmic poisoning set in. The patient was purged, sweated, and even bled, with temporary relief, but all in vain; she sank. Since then an east wind has been regarded as distinctly dangerous in many cases. Nor has an increasing experience modified the suspicion with which the veering of the wind-vane to the east has been watched and noted.

"It seems in some way to pervert or interfere with the transformations going on in the liver, and to modify them so as to charge the blood with waste. The expression a 'bilious chill' has long been adopted here to signify a condition where a chill has operated malignly upon the liver and its processes, perverting them and disturbing the economy."

A TRIUMPH OF MODERN SURGERY.

At a recent meeting of the Royal Society in London, Dr. MacEwen gave a detailed account of a very remarkable case of the transplantation of bone in the human subject. It is of special interest as being the first instance in which this osseous transfer has been successfully effected. We take the following abstract of Dr. MacEwen's paper from one of our English exchanges: —

In 1878 a child of three years was admitted into the Glasgow Infirmary for necrosis of the right humerus, the shaft of which was already separated from its head at the epiphyseal junction. Fifteen months after the necrosed portion had been removed there had been no bone formation of any account, and over two thirds of the shaft was wanting. A first transplant of bone was then performed. In making the sulcus for the reception of the graft, reliance had to be placed on anatomical relations as to correct position, as there was no trace of periosteum or fibrous structure to indicate the former location of the bone. Portions of human bone were transplanted on three different occasions, the grafts being obtained from patients affected with anterior tibial curves, from whom wedges of bone had to be removed for the purpose of straightening their limbs. These osseous wedges were each divided into many small pieces, which were immediately placed in the sulcus in the boy's arm. The fragments united together as well as adhered to the head of the humerus above and to the condyles below, ultimately forming a solid rod only half an inch shorter than the humerus on the opposite or left side. This transplantation of bone converted a useless arm into a thoroughly useful one. Great stress was laid by the operator upon the subdivision of the transplanted bone into fragments, as thereby greater nourishment is able to be conveyed from the surrounding flesh to the osseous formation. The conclusions arrived at are that transplanted bone is capable of living and growing, and that such transplants are capable of being put to practical uses beneficial to mankind; but that to insure success the transplantation must be conducted antiseptically.

ALCOHOL IN THE ARMY.

A careful study of the effect of the "spirit ration" in the British army was lately made by a writer in the *British Medical Journal*. His conclusions were as follows: —

(1.) Spirits are not an absolute necessity in the field.

(2.) Given before or during a march, or work of any description, they are nearly always calculated to do harm.

(3.) The only case in which exception need be made to the above rule is when men are near the end of a long and fatiguing march, which it is necessary should be accomplished. Then the issue of a spirit ration may probably supply the necessary stimulus for completing the work; but it must be on the condition that no further work shall be demanded until after a sufficient period of repose.

(4.) The issue of a ration at night, when work is done, may be useful as a sedative, and in inducing calm and refreshing sleep.

(5.) Under any of these circumstances, the ration ought not to exceed two ounces and a half (half a gill) of spirits, — equal to one ounce and a quarter of alcohol; and it ought to be given well diluted with water, — hot, if possible.

Even in cases where its utility is, with limitations, admitted, it is still a question whether extract of meat might not be better, as it certainly would be attended with less chance of evil result, should it not accomplish the immediate end contemplated. Admitting, however, that in cases where rapid stimulus is required alcohol is more useful than any of the proposed substitutes, there seems to be no valid ground for continuing its issue on campaigns as a regular ration. It would be better to carry it as an extra, and issue it only by the advice and with the concurrence of the medical officer.

MORPHIA WITH CHLOROFORM AS AN ANÆSTHETIC.

Dr. Crombie advises the combined use of morphia and chloroform in producing and maintaining surgical anæsthesia, as the result of an extended experience. He considers that this expedient, originally proposed by Claude Bernard, has not received the attention which it deserves. At the moment when the administration of the chloroform is being commenced, one sixth grain of morphia should be administered hypodermically. As a result of this precaution the subsequent anæsthesia is quiet and sleep-like, and may be prolonged for an indefinite period with quantities of chloroform which would be quite inadequate under ordinary circumstances. The quantity of chloroform required is so much less that the dangers and inconveniences commonly incurred during and after prolonged anæsthesia are entirely avoided. In operations about the mouth and face, where the continued administration of an anæsthetic is inconvenient, the prolongation of the effects of the chloroform secured by the combination with morphia is especially advantageous. Of course the early cardiac paralysis of chloroform, before anæsthesia, is not prevented; but all the other dangers resulting from a too free or too long-continued administration are most happily escaped in this way. The author hopes that by observing the preliminary precaution of a hypodermic injection of morphia the use of chloroform may come to be considered as safe as that of its less agreeable rival, ether.

THERAPEUTICAL HINTS.

An Exhilarating Mixture. — Professor Luton, of Rheims, relates, in the *Bulletin de Thérapeutique*, that, having administered to a patient a mixture of tincture of ergot and of phosphate of soda, he was greatly surprised to find it after a while produce the most exhilarating effects, exciting loquacity and irresistible laughter, which lasted for several hours, and much resembled the slight intoxication produced by light wines and champagne. The mixture was tried on some other persons, always with the same effects, these being producible, however, only in women, especially those of a nervous temperament. Men resist its effects, probably requiring, as the author supposes, stronger doses in consequence of their being more accustomed to alcohol. The formula employed in the production of these curious effects was for a medium dose, in a person sufficiently excitable, as follows: tincture of ergot five grams, and solution of phosphate of soda (at one tenth) fifteen grams. This is poured into a little sugared water, and taken fasting. As a therapeutical agent, Professor Luton suggests it might prove useful in some cases of hypochondriasis, and in the algidity of hysterical subjects and those who are very liable to spasm. The algidity of the early stage of fever or cholera might also be favorably influenced. So also in various cases of anæmia and adynamia, the mixture, in reduced doses, so as not to excite excessive hilarity, might prove useful. At all events, having had the mixture under notice for more than a year, Professor Luton deems it right to make it public.

Relief of the Pain of Cancer. — M. Anger, in *L'Union Médicale*, prescribes a lotion of one part of sulphate of atropia to 1000 parts of distilled water. Compresses wetted with this solution are applied to the painful part, and covered with oiled silk or gutta-percha, renewing them three or four times daily. They give material relief to pain without causing symptoms of absorption, such as dilatation of pupils or dryness of throat. The action seems to be entirely local, consisting in contraction of the vessels with diminution of sensibility.

Chlorate of Potash for Mountain Fever. — Mr. Edward Whymper, in a lecture on the ascent of Chimborazo and Cotopaxi, mentioned the value of ten-grain doses of chlorate of potash in the attacks of mountain fever which most mountain travellers experience when they reach a height of about 15,000 feet above the sea-level. The symptoms are headache, sickness, hot and cold fits, and apnœa, which manifests itself by a series of periodical gulps.

Anti-Febrile Action of Hydro-Chinone. — Brieger says that in small doses of 3 to 9 grains, hydro-chinone possesses the property of promptly reducing the temperature in fever without exciting

the patient or inducing unpleasant after-effects. Unfortunately, its effects are of short duration; but as it is very soluble in water, and non-corrosive, it can be employed with advantage for hypodermic injections, where the patient is unable to retain remedies administered in the usual manner.

HOLTZ MACHINES FOR MEDICAL USE. — Dr. Morton, who advocates the use of these machines for medical purposes, states that small machines are totally useless therapeutically. He advises a double 20-inch plate or a 15-inch four plate machine as the smallest that should be bought. To insure its working at all times it must be kept in a glass case containing chloride of calcium or sulphuric acid.

TARTAR EMETIC IN THERAPEUTICS. — Dr. A. B. Arnold, of Baltimore, thinks this remedy has fallen into undeserved neglect. In inflammatory croup it is capable, if early used, of keeping it in the catarrhal stage, and preventing its passage into the membranous form. He gives in these cases one twelfth of a grain every hour to a child. In one case, aged six years, he gave one fourth of a grain every hour, with excellent results.

THE BEEF JUICE FUROR. — In the present *furor* for fluid beef juice, says Dr. Fothergill, the necessity for starchy matters is being quite overlooked, or, to be very safe, underestimated. These meat products furnish — the best of them — little glycogen or animal starch, and yet that is the fuel food of the body *par excellence*. We must be guided by rational knowledge, by physiology and not by fashion, in our dietetics.

SUMMER DRINKS.

THE London *Chemist and Druggist* gives the following recipes for these seasonable beverages: —

(1.) *Ginger Beer.*

Brown sugar	2 lbs.
Boiling water	2 galls.
Cream of tartar	1 oz.
Ginger, bruised	2 oz.

Infuse the ginger in the boiling water, add the sugar and cream of tartar; when lukewarm, strain, then add one half pint of good yeast. Let it stand all night; then bottle. If desired, a lemon may be added, and it may be clarified by the white of one egg.

(2.) *Lemon Beer.*

Sugar	1 pound.
Boiling water	1 gall.
Lemon, sliced	1.
Ginger, bruised	1 oz.
Yeast	1 teacupful.

Let it stand 12 to 20 hours, after which it may be bottled.

(3.) *Hop Beer.*

Sugar	4 lbs.
Hops	6 oz.
Water	q. s.
Ginger, bruised	4 oz.

Boil the hops for three hours with 5 quarts of water, then strain; add 5 more quarts of water and the ginger, boil a little longer, again strain, add the sugar, and when lukewarm add one pint of yeast. After 24 hours it will be ready for bottling.

(4.) *Spruce Beer.*

Hops	2 oz.
Sassafras, in chips	2 oz.
Water	10 galls.

Boil half an hour, strain, and add: —

Brown sugar	7 lbs.
Essence of spruce	1 oz.
Essence of ginger	1 oz.
Pimento, ground	½ oz.

Put the whole in a cask, and let cool; then add one half pint of yeast, let stand 24 hours, fine and bottle it.

SELECT FORMULÆ.

TOOTH POWDER. — The *Chemical Journal* gives the two following recipes: —

(1.)	Precipitated chalk	oz. 8
	Powdered myrrh	oz. 1
	Powdered cuttle-fish bone	oz. 2
	Powdered orris root	oz. 3
	Sulphate of quinine	grs. 10
	Oil of cinnamon, Oil of rose, Oil of cloves	āā. gtt. 5
(2.)	Powdered orris root	oz. 2
	Powdered borax	oz. 1
	Precipitated chalk	oz. 4
	Powdered cuttle-fish bone	oz. 4
	Powdered krameria	oz. 2
	Powdered myrrh	oz. 1

ESSENCE OF TEA ROSE. — The following is a good preparation: —

Oil of rose	fl. dr. 2
Oil of patchouli	fl dr. 2
Alcohol	fl. oz. 12 M.

ADMINISTRATION OF SALICYLIC ACID. — The following is commended as an excellent vehicle for salicylic acid: —

Salicylic acid	oz. i. sc. viij.
Citrate of potassium	oz. ij.
Glycerine	oz. viij.
Simple elixir, sufficient for	Oj.

Dissolve the citrate in the glycerine with the aid of a gentle heat, and then stir in the acid, maintaining the heat, till all is dissolved. When cooled, the elixir is to be added and the mixture strained. Each fluid drachm contains 5 grains of the acid, and is miscible with water in all proportions.

CHOCOLATE SYRUP FOR SODA WATER. — A correspondent of the *Druggists' Circular*, after referring to the difficulties in preparing this popular syrup, gives the following formula and directions: —

Baker's chocolate (plain)	4 ounces.
Boiling water	4 "
Water	28 "
Sugar	30 "
Extract of vanilla	½ ounce.

Cut the chocolate into small pieces, then add the boiling water, and stir briskly until the mixture forms into a thick paste and assumes a smooth and uniform appearance. Then slowly add the remainder of the water, stirring at the same time, and set aside until cold. After cooling thoroughly, a layer of solid grease forms over the surface, which is to be carefully removed by skimming; after this is completed, add the sugar, dissolve by the aid of a gentle heat, and allow the whole to come to a boil. Then strain and add the extract of vanilla.

This forms a syrup which is perfect. It possesses the pure, rich flavor of the chocolate, without the unpleasant taste which is obtained if the solid fat is not removed. In removing this objectionable substance, none of the flavor of the chocolate is lost, as the grease contains little or no flavor, and therefore is of no benefit to the syrup.

SODA WATER FOAM. — Beat two whites of eggs with twelve fluid ounces of water, and dissolve in the liquid two ounces of white sugar and half a drachm of salicylic acid. Add one fluid ounce of this mixture to every pint of syrup.

LAVENDER WATER. — The following recipe for this toilet water is commended: —

Oil of bergamot	30 parts.
" " lemon	15 "
" " geranium	5 "
" " lavender (Mitcham)	140 "
Essence of musk (1.5 parts in 100 parts)	0.5 "
Balsam of Peru	60 "
Storax	125 "
Civet	1 part.
Alcohol	10,000 parts.

Dissolve the ethereal oils in the alcohol; digest the other substances with this solution for at least four weeks; then pour off clear, add enough water just to reach the point at which the liquid begins to be very faintly opalescent, and filter.

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CHEMICAL ANALYSIS. — As will be seen by a card elsewhere, we have secured the services of a competent chemist to attend to any analytical work that our friends may entrust to our charge. Professor Hallock is a graduate of Columbia College, New York, and of Heidelberg University, Germany, and is thoroughly fitted for the work.

WE would call the attention of advertisers to the superior facilities afforded by the JOURNAL for bringing their goods before a large circle of intelligent readers. Mr. Henry W. Lincoln, a well-known pharmacist of Boston, who has recently undertaken the management of this branch of our business, will be glad to furnish estimates for space, etc., and will take pleasure in calling on those who have no time to call on him. We bespeak for him a kindly reception.

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WE desire to call the attention of our readers to the advertisements, on the first page of our present issue, of two insurance companies, both old and reliable companies, one for "fire," and the other for "life," — the Shoe and Leather Insurance Co., and the New England Mutual Life Insurance Co.

ATTENTION is called to an advertisement on page 5, which has appeared in our columns before, which we are always glad to speak well of. It is Milk of Magnesia, an article endorsed by leading physicians throughout the country as the best preparation known for all disturbed conditions of the stomach.

CEPHALINE comes within the reach of all. It is the best nerve food known. See page 4.

ELECTRICITY is at present attracting more attention than it has ever before done, and those who wish to experiment in this direction will do well to call on Thomas Hall, 19 Bromfield St., before purchasing their supplies. See advertisement on page 5.

WE have made arrangements with wholesale dealers in minerals and scientific books, by which we are able to supply our patrons at the same rates as they can obtain them directly. Books will be sent postpaid on receipt of publishers' price; minerals, being much heavier, will be sent by express or freight, as the purchaser shall request.

Boston Journal of Chemistry
AND
POPULAR SCIENCE REVIEW.

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Familiar Science.

OUR DOCTORS.

A DOCTOR of physic is a man who is presumed to understand, by prolonged and careful study, the anatomy and physiology of the human organization; he is also presumed to know the nature and tendencies of morbid chemical and vital changes in the organization, and what is best to be done to change morbid action to healthy or normal condition. This, it must be conceded, is a great deal for one man to know; and yet there are many other kinds of knowledge which must be possessed by a well-educated, competent physician.

There are but few men fitted by nature safely and successfully to attend upon the sick. Mere education does not fit one for the practice of medicine, any more than education fits one for success in teaching, or in preaching, or in the practice of the legal profession. The best scholars from our schools often prove dead failures in every department of practical life, and are heavy encumbrances on society. Fortunately, poor lawyers, poor preachers, poor teachers, speedily drop down to the dead level of neglect and forgetfulness, and are jostled out of the way by a crowd of abler men; but, unfortunately, a poor doctor may hold on his way, and even crowd to the wall a man of superior education and abilities in the same profession. It is easy for the popular mass to detect incompetency and charlatanry in lawyers, preachers, and teachers, but the doctor works on a totally different line; he is not required to write, talk, or in fact do any act which is fairly open to the world. A patient in his hands may die from neglect, and who can successfully maintain against him a charge of malpractice? He may poison his sick dependents with drugs, and who can know that he has not used requisite skill in his work?

The disadvantages under which the public rest in their relations to physicians are numerous and positive, and it is not easy to see how they can be fully removed. A coarse, vulgar charlatan is easily detected by persons of ordinary intelligence and sagacity, but even such manage to thrive in many communities not distinguished for ignorance or credulity. The low, unlearned quacks are bad enough and numerous enough in every community, but they are not always the most dangerous class that presume to prescribe for the sick. Our legalized schools of medicine turn out every year scores of young men who are no more competent to practice the healing art than they are to use the brush of the painter or the chisel of the sculptor. They go out into the world under the cover of a "diploma," a sort of license of a supposed respectable character, which raises them above the plane of the recognized quack, and gives them standing in the community. These men are more dangerous than the vulgar charlatans because they escape, to a larger extent, public scrutiny and suspicion. Are these men generally bad or uncultivated? Are they dangerous outside of the profession they have chosen? By no means. They may have the best intentions; but still, as doctors, intrusted with the care of the sick, they are dangerous men. And this comes from the fact that they have mistaken their vocation; they have not the natural and perhaps the acquired requisites which fit them for the practice of the healing art. It is immensely unfortunate for our civilization that we have no means or appliances whereby the chaff can be winnowed from the wheat in the ranks of our doctors. It does not comparatively matter at all in the other professions; the perfect kernels and the rubbish may remain together without serious detriment. The law of the "survival of the fittest" will take care of the world's interests in the contact of these classes with society; but it is quite otherwise with the medical class.

So far as a knowledge of drugs or remedies goes in fitting one for the practice of medicine, that is easily acquired; and so far as a general knowledge of the physical organization reaches that end, that also may be readily acquired; but these branches of knowledge together do not fit one to do what may be done to remove disease. Knowledge of these kinds may even be potent for mischief, when possessed by those who have not other important qualifications.

A physician of the highest order is the man who is great in emergencies, who is keen in discernment, cool in judgment, sagacious in expedients, assuring in demeanor, kind in counsel. The great physician is one who relies but little upon medicines, little upon dosing, little upon specifics. He realizes that if a cure comes nature, in nine cases out of ten, must have the credit. He does not forget, however, that in certain cases remedies used at the right time may be of great service in assisting nature. The safe physician must of necessity be a great man; in fact, the greatest of men among those engaged in the active duties of life. No ordinary man can be a great or safe doctor. We give to the term *safe* here used its highest significance. A man who is not *great*, who has not peculiar qualifications, is not, as a rule, a safe man to have charge of the sick.

Take the young men as we find them in our high schools and colleges, and out of groups of one hundred there are not usually more than two or three who have any moral right to enter upon the study of medicine with the view to engage in practice. One's career in that profession cannot be negative; it must be positive, — positive for good or evil, positive as a curse or a blessing. Pain and suffering are factors in our natures of the very highest consequence, and must have the best attention human skill can bestow.

It may be said that if the standard of the good physician is raised too high, the supply fails; there are not enough competent men born to meet the requirements. This cannot be so; the trouble is not that nature fails to supply a want in any department of man's duties, but men do not fall into their appropriate places. There are thousands of doctors who ought to be in some other calling, and there are other thousands who ought to take their places.

The boy who is fitted by nature to become a physician often in early life evinces an aptitude for the profession which is unmistakable. He is studious, thoughtful, cool, ingenious, fruitful in expedients, analytical, faithful, conscientious. A boy doubtful in his habits or morals, dull in apprehension, slow and indecisive in character, listless, stupid, weak, or timid, should never be allowed to enter the medical profession. It is no place for him; his career can result only in mischief, and the degree may be great. After all desirable traits are embodied in a doctor, he is still but a broken reed upon which to lean in times of physical or mental weakness and peril. It was never designed that human beings should be saved from all suffering through man's instrumentality. How obscure to mortal ken are the causes of pain! No eyes are capable of piercing to the seat of disease in the human organism; no perceptions are keen enough to detect morbid conditions of any kind with satisfactory positiveness. And, also, there is no remedy for all bodily ailments; the substances called medicines are at best of doubtful use in a large majority of cases of illness. If the value of a doctor is estimated by his intimate knowledge of drugs alone, he is estimated by a false standard. In medicine there are many systems, all claiming to be the

best, and yet the theory and practice differ radically in every respect. Some doctors believe in drugs, and prescribe them in heroic doses; others discard them almost entirely. The pharmacopœia of one physician consists of ten thousand distinct remedial agents, while another reduces it to the standard of the facetious Dr. O. W. Holmes, namely, wine and opium. If one of the two is to be rigidly followed, we prefer the latter. It may be said with truth that if there was no pharmacopœia extant, — if we had no remedies save those which the good mother or nurse is perfectly familiar with, — still the good physician would fill as important a place in the world as he ever has filled. We need him for counsel, for advice, for a pillar of support, in our hours of weakness and doubt; we need him for encouragement in times when disease lingers and hope almost departs from the soul; we need him to cheer and lift us up as does the bright sunlight when it breaks through the dark clouds of winter, or as do the sweet odors of flowers fresh from the hand of the sympathizing gardener, who remembers us when illness holds us in its grasp.

ROBERT WILHELM BUNSEN.

A RECENT number of *Nature* contains a portrait and sketch of the life of the celebrated Heidelberg professor, whose name has been immortalized by his inventions, prominent among which is the Bunsen lamp and the Bunsen battery. This plain, substantial old disciple of science, whose genial face is so truly portrayed in the steel engraving that accompanies the sketch, lives quite alone in a suite of rooms adjoining his laboratory and overlooking the smaller market-place in Heidelberg. Each morning at nine o'clock, and on Saturday mornings in summer at seven also, he greets a class of most attentive listeners, gathered from all parts of Europe and America. Without manuscript or notes he discourses pleasantly, without ostentation or brilliant exhibitions, but with simple and instructive experiments which prove something upon the fundamental principles of chemistry. Most of his apparatus is devised by himself, and frequently of his own construction, so skilful is he in glass-blowing. The excessive modesty of the man is very striking. While many of the laws he discusses and methods he describes are his own discoveries, he always neglects to mention that fact. When describing the spectroscope he may let fall the name of Kirchhoff, his famous colleague, but never insinuates that he had any hand in it. Of his celebrated discovery of cæsium and rubidium he simply remarks that these metals were discovered by means of the spectroscope; who discovered them he does not say.

From his lecture-room he passes at once to the laboratory, where some fifty students are at work, nearly half of whom speak the English language, so popular is he both here and in England. Here he spends the greater part of the day, with the exception of the hour following his noonday meal. At that time you will generally meet him on the shady promenade of the *Anlage*, accompanied by his friend Hermann Kopp, each smoking huge cigars, as if their reputation depended on the smoke they made. Bunsen is a very large man, while Kopp is quite short; the former points his cigar downward in smoking, the latter upward, which produces rather a ludicrous effect. The Geheimrath (private counselor), as Bunsen is always called, is somewhat deaf, and the shrill voice of his smaller comrade can be heard for some distance around.

In the laboratory the Geheimrath is one of the kindest teachers, always ready and happy to show the youngest of his pupils any point, however simple. He has unlimited patience, never gets in a hurry, is very particular in his methods and manipulation, insists on the greatest neatness, and smokes continually.

Bunsen completed his seventieth year on the 31st of March, 1881. His father was a professor of theology in Göttingen, where he graduated while yet in his teens, and became privatdocent when only twenty-two years old. In 1836 he was made professor of chemistry at the Cassel Polytechnic, and two years later was appointed to the chair of chemistry in the University at Marburg, where he remained for thirteen years. He was also in Breslau for a short time, and thence removed to Heidelberg, with which his name has been associated for the last thirty years.

A review of his contributions to science, both in the departments of chemistry and physics, would far exceed our modest limits; a few, however, may bear mention.

Several of his researches were upon arsenic, a substance that many chemists are afraid to investigate. One of his earliest researches was upon the action of moist ferric hydrate on arsenic, proving that when administered at once in large quantity it is a certain antidote. Bunsen was also the discoverer of *cacodyl*, the villainous-smelling compound of arsenic with carbon and hydrogen, "a true organic metal," as he termed it. Its study nearly cost him his life, for, as Roscoe says, in analyzing the cyanide of cacodyl the combustion tube exploded. Bunsen lost the sight of an eye, and for weeks lay between life and death, owing to the combined effects of the explosion and the poisonous nature of the vapor. Bunsen's flame test for arsenic is one of the prettiest little reactions in chemistry. For years he sought an accurate method for the quantitative determination of arsenic and its exact separation from antimony. At last success perched once more upon his banner. In the spring of 1878 he hit upon a method which, owing to its simplicity, took the chemical world by surprise. The method, which depended upon the use of sulphydric acid, was described by us at that time.

We have already mentioned the Bunsen lamp, without which no chemical laboratory could exist at present. But he also devised a complete system of gas analysis, which he employed in the study of the reactions that take place in a blast-furnace, and with which he analyzed the gases evolved from volcanoes and hot springs. There is scarcely an accessible volcano that he has not visited and studied; he very carefully examined the Islandic rocks and the pseudo-volcanic rocks of Iceland, and investigated its famous geyser. He invented too the form of battery composed of zinc and carbon, and with it succeeded in preparing many rare metals, beginning with magnesium and ending with the cerium group. With the aid of an ice-calorimeter, also of his invention, the specific heats of the cerium metals were determined, and from these their true atomic weights. In the department of physical chemistry, too, should be mentioned his method of determining vapor densities.

The filter-pump, often called by his name, was the invention of Sprengel. The methods of using it for rapid filtration belong to Bunsen.

His part in the establishment of spectroscopic analysis is too well known to need repetition. Having discovered two new metals by its use, he set to work and evaporated 40 tuns of the Dürkheim mineral water, from which he obtained 16½ grams (a little over ½ ounce) of the mixed chlorides. These he succeeded in separating by methods which he devised for the purpose.

His many other researches we must pass over. One of these, on the measurement of the chemical action of light, was conducted conjointly by Bunsen and Roscoe. In describing it Professor Roscoe says: "In all the difficulties and perplexities by which the experimental investigation of such a subject is beset, the writer never knew Bunsen discouraged or at a loss for an expedient by which an obstacle could be overcome. Cheerful and self-reliant under the most depressing circumstances, he never gave up hope, and thus it was that these somewhat intricate and difficult investigations were brought to a successful close."

SCIENCE OF VALUE TO ALL MEN.

M. QUATREFAGES, in an address before the French Association for the Advancement of Science, at Bordeaux, thus emphasizes the value of scientific knowledge, not only for those who make it a specialty, but for all practical and intelligent men: —

All men cannot be expected to enlist under the banner of professional science. But all may and must acquire scientific notions, sufficient at least to understand the utility of the intervention of special men, and to be able to judge when that intervention becomes necessary. Science is nowadays omnipresent, and tends more and more to become the sovereign of the world. What industry is there that does not want the help of the engineers, and would remain content with the progress already accomplished? What branch of manufacturers would decline the help of chemistry? What medical practitioner, worthy of that name, would consent to forsake physiology, that complex science, the offspring of chemistry, and would do without natural philosophy any more than anatomy? What intelligent agriculturist does not understand that the problems of culture and production are essentially questions belonging to zoölogy, botany, geology, and chemistry? And in this great city, one of the queens of universal commerce, what merchant would deny the importance of geography?

Science is as indispensable to the military man as it is to the manufacturer, the medical practitioner, and the agriculturist. I am not going to undervalue the share that, in war, falls to inspiration and gallantry. But inspiration must be enlightened by study, and courage must be aided by weapons equal in efficiency and power to those of the enemy. No more than the agriculturist or the manufacturer can the officer master all the sciences the help of which is necessary to his profession. He cannot be expected to solve by himself all the problems raised by his single art. It is essential that he should first ascertain these problems, and confidentially appeal to scientific men, pointing out to them the application he wants. Let us, therefore, stir up the intellect of all men. Surely, we may hope to bring to light

many treasures which, for want of the opportunities which it will be our object to create, might remain buried in the darkness of ignorance.

Our task will be fulfilled only when every man exercising any influence on his neighbor, or having any amount of leisure on his hands, shall have become an enlightened friend of science; when the least among laborers shall know what principles regulate the processes and the practice of his handicraft. . . . Look at the results obtained in England by our eldest sister, the British Association. It is owing to its action that part of the population of England has undergone a transformation. The sons of fox-hunting squires are now geologists, philosophers, botanists, archæologists, etc. It is a banker who presides over the Anthropological Institute, and a brewer who is at the head of the Astronomical Society. The British Association reckons its members by thousands, and all the principal towns dispute the honor of its visits. Let us, then, begin our work with confidence; let us spare no efforts, for none shall be in vain. We know now that in the physical world there is no loss of power, no loss of matter. It is so, and even to a more absolute degree, in the moral world. Will is also a power, a power that increases and multiplies by transforming the minds of men, like a ferment. We have the will for good; let us resolutely apply it, and we shall develop the intellects and raise the hearts of men by the diffusion of scientific knowledge.

DRESS VERSUS DRAPERY.

A WRITER on "Dress Reform," in the London *Sanitary Record*, while laying due stress upon making female apparel artistic and tasteful at the same time that proper attention is paid to hygienic requirements, thus points out a popular error on the subject: —

One radical mistake we make with regard to modern dress is to look upon it as an affair of drapery. Let us keep drapery for bed and window curtains, to cover statues or lay figures; but for the dress of women, in the crowded, bustling life of the nineteenth century, it is totally out of place. We want to be clothed, not draped. The idea of beauty, therefore, derived from flowing drapery (and this seems to be the chief one of the so-called æsthetic school) is of no use to us, as not applicable to modern daily life. Whenever we think of the beautiful with regard to dress we immediately recur to the ancient Greek models, and to the drapery which looks so grand and graceful on the Greek statues; but we forget that when the Greeks engaged in active exercise their draperies were thrown aside. Any one visiting our Australian colonies may see many a handsome native draped in his blanket or beautiful flax mat, but when at work, especially at a distance from European settlements, a very small amount of drapery is retained. Ornamental drapery is suitable to a bygone age, or for a savage life, but for modern life it is out of place, because civilized society does not permit the throwing off of superfluous garments at pleasure.

Modern dress must learn to gain what beauty it can without the aid of superfluous drapery: from the beauty of the form it covers, from its graceful movements, and by discarding the false and hideous outline which fashion would give it. We must also put aside, at least for the present, the idea that art can improve nature; for this we must wait until we have obtained a more correct knowledge of the 'nature' we have to improve. If not, the result will be what it always has been, the deforming and caricaturing of the figure rather than its improvement. We are even now threatened with the re-introduction of a specimen of this false taste. Crinolines are to be worn again, for the double purpose of 'improving nature' by setting a lump on the middle of a woman's back, and of making her carry about a frame over which to hang 'drapery.'

SNOW-BALLING A FIRE.

A MONTREAL paper relates the following incident, which is probably unique in the "fire record" of that or any other city: —

One morning in January, 1826, after a heavy fall of damp snow the day before, a fire broke out in a large wooden warehouse, in which were stored six hundred barrels of pork and several hundred barrels of flour. It evidently caught near the top, for in a few minutes the roof of the building, which was of great length, was almost wreathed in smoke and flames, while the walls remained intact. A large crowd of men and boys rapidly collected, but the engine for some reason not arriving, and the river, the only source of water supply, being covered with thick ice, and, above all, the crowd being without a leader and utterly confused, nothing of importance was done to stop the fire, and the building seemed doomed to complete destruction. Just as the idea had settled into a conviction in the minds of those present, Henry Corse came rushing over to the scene from his factory, shouting at the top of his voice, "What are you thinking of, men? Why don't you snow-ball that fire out?" and, suiting the action to the word, he caught up a handful of the damp snow and flung it upward. The crowd caught the idea on the instant: all they wanted was a leader, and making a solid rush forward they caught up the snow at their feet, and a moment later half a thousand snow-balls were mounting fireward, and falling with a hiss upon the blazing timbers. Never was just such a sight seen before; the immense crowd surrounded and stormed the fire-fiend with a will, cheering and shouting in their excitement; the snow missiles flew upward thicker than hail falls in December. The great snow-ball fight of Napoleon and his fellows at Brienne school was nothing in comparison to it. Almost after the first half dozen volleys the fire seemed to pause as if astonished at the novel mode of attack; before it could recover, another and another storm of balls fell upon it, until beaten and battered down at one point and flaming out at another, assailed with a moving wall of icy missiles wherever it burst out with renewed violence, in an hour's time it was completely baffled and under control, and in another hour entirely subdued. The only loss to the building was its roof, badly burned, while the stores of pork and flour inside were comparatively undamaged.

SCIENTIFIC BREVITIES.

CONDITION OF THE SAHARA. — Dr. Lenz, in a recent lecture at Paris on his journey from Morocco to Timbuctoo, has been correcting some of the generally received notions as to the condition of the Sahara. It really forms a great plateau, about eleven hundred feet above the level of the Atlantic. In no part of this plateau is there found that depression below the level of the ocean which is shown on the maps of certain geographers, and which has led to wild schemes of converting the Sahara into a great inland sea. Moreover, the Sahara is not one dead, sandy level, but is really greatly varied in its aspect. Rocks are succeeded by sandy plains; here and there are oases covered with alfa grass and stagnant, shallow sheets of water. The fresh-water fossils, which are met with in many parts, show that the Sahara is not the bottom of a dried-up sea. Again, the temperature is not nearly so hot as might be expected. In short, the Sahara is not so bad as it has been called; wild beasts are rare, and the most formidable enemies to be met with are the Touraeg tribes, who, according to report, recently massacred the French trans-Saharan expedition. As to Timbuctoo, Dr. Lenz found he had to traverse a great space covered with ruins before he could reach the inhabited part. There are now only twenty thousand inhabitants.

BURSTING POWER OF ICE. — Ed. Hagenbach experimented, during the past severe winter, upon the bursting force exerted in the expansion of water when freezing. Two interesting experiments were made with cast-iron hand grenades. The outer diameter was 15 centimeters (5.9 inches), the inner diameter 12.8 centimeters (5 04 inches). The shells were filled with water, closed with a screwed iron plug, and exposed to the cold. Both shells were broken, and a curved thread of ice was projected from the upper surface. One of the plugs was evidently thrown out with great violence, and to such a distance that it could not be found. The curvature in that case was upward.

THE NOISE OF THE FINGER. — Dr. Hammond says that when you poke the end of your finger in your ear the roaring noise you hear is the sound of the circulation in your finger, which is a fact, as any one can demonstrate for himself by first putting his fingers in his ears, and then stopping them up with other substance. Try it, and think what a wonder of a machine your body is, that even the points of your fingers are such busy workshops that they roar like a small Niagara. The roaring is probably more than the noise of the circulation of the blood. It is the voice of all the vital processes together, — the tearing-down and building-up processes that are always going forward in every living body, from conception to death.

THE FOSSIL MAN OF NICE. — Some human remains, evidently of great antiquity, were discovered a few months ago at Carabacel, near Nice, and have been reported upon by a local scientific committee, as well as examined by M. de Quatrefages. The bones had not been artificially interred, but were found embedded in a deposit of calcareous clay, at a depth of about nine feet from the surface. This deposit was irregularly stratified, and contained a mixture of Pliocene and Eocene shells, showing that it had been formed by the reconstruction of the pre-existing strata. Of the bones, the most remarkable is the lower jaw, which shows that the fossil man of Nice belongs to the same race as M. Rivière's skeleton from Mentone, both being probably of Palæolithic age.

"MYSTERIOUS DISAPPEARANCES" EXPLAINED. — A correspondent of a French paper, commenting on the number of "mysterious disappearances" constantly occurring, not only in France, but also in England, starts an absurd theory. He maintains that death occasionally is actual dissolution. Persons attacked by this form of disease suffer no previous illness, have no warning of their approaching end, but suddenly cease to exist, and as immediately fade from sight. He asserts that some years ago he actually witnessed this phenomenon. He was out walking with a friend, with whom he was engaged in an interesting discussion on a political question of the day, when instantaneously his companion vanished, and from that hour to the present time has never reappeared. He has little doubt that many of the missing persons so anxiously searched for by their friends and by the police have in like manner "melted into thin air." At the moment of his friend's disappearance a strong sulphurous odor pervaded the atmosphere around, but beyond this nothing remarkable was to be observed. The question is, he thinks, worthy of medical investigation.

KANT'S SKULL. — Professor Kupffer, of Königsberg, describes the skull of Kant, which was recently disinterred. Its capacity was 1715 cubic centimeters. The sutures were remarkably perfect, well retained and regular. The skull is broad for its length and height. The right side of the cerebral portion and the left of the cerebellar portion

were the most developed. The cavities of the eyes were unusually high. In general, it was a mixed type, as Kant himself was, his grandfather having been a Scotchman and his mother a South German.

A New Optical Experiment. — M. Grandmont lately described to the French Academy of Sciences an optical experiment giving a curious result. The apparatus consists of a black disc with five apertures; behind this is placed a white or a colored disc. If the upper part of the disc near the centre be regarded fixedly for some seconds, and the colored disc be then rapidly replaced by the white disc, the eye does not perceive the white through the apertures, but the complementary color of the colored disc which has been removed.

The Camera in Forgery. — It is stated that the Bank of France has almost entirely abandoned chemical tests in favor of the camera for detecting forgeries. The sensitive plate not only proclaims forthwith the doing of the eraser or penknife, but frequently shows, under the bold figures of the forger, the sum originally borne by the check. So ready is the camera to detect ink marks that a *carte-de-visite* inclosed in a letter may to the eye appear without blemish, while a copy of it in the camera will probably exhibit traces of writing across the face, where it has merely been in contact with the written page.

The Largest Pyramid. — We believe it is not generally known that the largest existing pyramid rests on American soil. The Pyramid of Pueblo, in Mexico, is larger than the great Pyramid of Cheops, in Egypt. The latter covers only fourteen acres, while the Mexican one covers forty-four acres of ground, and was originally 600 feet high. It is made of sun-dried brick, and is supposed to have been built 7000 years ago.

FOR THE MICROSCOPIST.

Farina under the Microscope. — In examining any kind of farina with the microscope to find whether a less nutritive farina has been mixed with it, it has been common to confine attention to the starch granules (which one may easily be mistaken about). Dr. Cattaneo, in an Italian journal, takes the ground that greater importance should be attached to the character of the bran particles, some of which are never wanting even in the most carefully bolted flour. These (as he shows) differ in a marked way according to species.

For the Microscope. — M. Certes has lately found a method of coloring infusoria and anatomical elements during life. Placed in a weak solution of chinoline blue or cyanine, infusoria are colored pale blue, and many continue to live 25 and even 36 hours. Strong doses poison immediately. Again, after being 24 hours in a moist chamber, the white blood corpuscles of a frog colored with cyanine show amœboid movements. The cyanine should here be dissolved in serum. Chinoline blue is, *par excellence*, the reagent of fatty matter. By affecting the cellular and not the nuclear protoplasm in infusoria, it shows fatty matters to exist only in the former. It should prove a useful means of studying cellular life.

Smoke and Steam Under the Microscope. — L. J. Bodaszewsky calls attention in *Dingler's Journal* to the rapid oscillatory movements which are disclosed by the microscope in the smoke of burning paper, wood, cigars, etc., when concentrated sunlight or electric light is thrown upon them with a lens. The particles are of a spherical form, and they are continually darting against each other, so as to represent very strikingly the motion of gas molecules according to the kinetic theory. Similar movements are observed in the vapors of nitric, sulphuric, and phosphoric acids, sulphur, ammonia, etc., when examined under the microscope by the light of a glowing platinum wire.

Practical Chemistry and the Arts.

THE ANALYSIS OF WATER.

The importance of pure water for drinking purposes is already well known, notwithstanding the fact that Dr. Emmerich, of Vienna, took his daily beverage from the dirtiest ditch he could find, and thought it beneficial to the system. (Journal of Chemistry for December, 1879.) The analysis of water early attracted the attention of chemists, but it is only quite recently that chemical analysis has afforded any true basis for judging of the wholesomeness of waters; and even to-day the best methods are not quite all that could be desired.

The early chemists devoted their attention to the mineral constituents, and satisfactory methods were soon devised for determining these. But it was soon discovered that these same mineral constituents were present in all waters, good or bad, in slightly varying quantities, and that unless present in very large amount they had no effect on the health. Beyond determining their fitness for use in medicine, in the arts, in steam boilers, and in manufactures, a determination of the mineral constituents of water is of very little practical use.

THE IGNITION METHOD.

When sanitarians began to teach that unwholesome water owed this property to organic matter contained in it, chemists sought a method for determining the amount of such matter. First the ignition method was employed. The water was evaporated to dryness, heated sufficiently to expel the water of hydration, say to 120° or 130° C. The residue was weighed; it was then strongly ignited, and weighed again. The loss in weight represented not only the organic matter burned out, but the carbonic acid in carbonates and all the ammonia salts. To compensate for the loss of carbonic acid, either carbonic acid water or a solution of ammonium carbonate was afterwards added and the residue gently heated. The difference in weight between the residue dried at 120°, and that left after ignition and the addition of carbonic acid is now reported as "organic and volatile." In Dr. C. F. Chandler's famous lecture on water, published in the *American Chemist*, vol. ii., the analyses of city waters are reported in this way. We append a few analyses reported as grains per gallon: —

	Inorganic.	Organic and Volatile.	Total Solids.
Croton water, N. Y., in 1867	3.90	0.66	4.56
Croton water, N. Y., in 1868	3.31	1.14	4.45
Croton water, N. Y., in 1869	4.11	0.67	4.78
Well west of Central Park, N. Y.	38.95	4.55	43.50
Cochituate, Boston	2.40	0.71	3.11
Fairmount, Philadelphia	2.30	1.20	3.50
Thames, London	15.55	0.83	16.38
Atlanta, Ga. (filtered)	1.03	0.83	1.36
Platte River, above Denver, Col.	9.59	6.41	16.00

These analyses were made by Dr. Chandler, Professor Horsford, Dr. Letheby, Professor Hallock, and Professor Hale respectively.

Although this method was in vogue for a long time, and is still used occasionally for comparison, it is in reality not very satisfactory.

WET COMBUSTION.

The permanganate method of analysis next came into favor. This has been called wet combustion. Potassium permanganate oxidizes organic substances in solution, carbonic acid is formed, and the permanganate is itself destroyed, as shown by its loss of color. If a solution of permanganate of known strength is allowed to drop slowly from a graduated tube into a measured quantity of water until a permanent pink color is produced, a *guess* can be made at the quantity of organic matter present. We do not really know how much organic matter was present, but we do know how exactly how much oxygen was required to oxidize this matter. German chemists are in the habit of reckoning five times the numbers obtained in the analysis as representing the total amount of organic matter. It is better to report it as "oxygen required to oxidize organic matter," and until recently the reports made weekly to the Board of Health of New York city read in this way. It is well to remember, however, that there may be other substances present in the water which have the same property of discoloring permanganate that organic matter possesses; among these are nitrous acid, ammonia, hydrogen sulphide, etc.: but as these are scarcely less objectionable than organic matter would be, we may safely lay down the rule that any water which discolorizes much of the permanganate solution ought to be rejected for domestic use as being of doubtful quality. It may be used as a qualitative test, being easily applied. When it becomes necessary to drink impure water, the addition of a few crystals of permanganate render it more wholesome by oxidizing the impurities. Tidy has recently introduced some modifications of this process, whereby two determinations are made, one lasting one hour, the other three hours.

In 1867 and 1868 two new methods for analyzing water were devised by Wanklyn and Frankland. Chemists were at first divided between the two methods, and the controversy between Wanklynites and Franklandites was very bitter. At the present time the method of Wanklyn, called the ammonia method, is almost exclusively employed, in this country at least.

ALBUMINOID AMMONIA.

Wanklyn distils a certain quantity of water, to which a little sodium carbonate has been added. The condensed steam contains all the ammonia, free and combined, that was present in the water. The quantity is determined by means of Nessler's solution. To the water remaining in the retort is added a solution of permanganate mixed with a very strong solution of caustic potash. The albuminoid substances are broken up by this reagent, and the nitrogen contained in them is converted into ammonia. This is distilled off and determined by "nesslerizing" also. This is reported as albuminoid ammonia.

We have subjected samples of (Boston) Cochituate water to Wanklyn's test, with the following results, the numbers representing parts per million: —

	Free Ammonia.	Albuminoid Ammonia.
I. Was taken June 2, 1881,	0.040	0.260
II. Was taken June 9, 1881,	0.035	0.255
III. Was taken June 16, 1881,	0.025	0.270
IV. Was taken June 23, 1881,	0.050	0.300
V. Was taken June 30, 1881,	0.025	0.360

This, we must confess, looks rather bad for our

own drinking-water, but, to quote Mr. Haine's lecture before the Franklin Institute, "Lake Cochituate probably contains considerable extract of peat, or other 'vegetable extractive matter,' which is, so far as we know, perfectly harmless in drinking-water." Professor Hale's report of an analysis of the water of Platte River, near Denver, Col., taken March 23, 1881, shows 0.53 parts of albuminoid, and 0.05 of free ammonia in a million, and we have recently analyzed well-water containing 0.33 parts of albuminoid ammonia.

COMBUSTION METHOD.

Frankland's method of estimating the organic matter in the water consists in evaporating the water to dryness, and burning the residue with oxide of copper, as in an organic analysis, and measuring the quantity of carbonic acid formed and of nitrogen set free. It is unnecessary to say that the operation is both difficult and tedious, while its results are still far short of what we could wish for.

CHLORINE.

Sewage contamination of water is undoubtedly the one thing most to be feared. Oftentimes a knowledge of the source of the water, whether from a river, well, or spring, the proximity of drains and cesspools, will enable the chemist to judge of the probable presence or absence of such contamination. A knowledge of the geological formation, dip of strata, and other circumstances are also valuable. Chlorine usual exists in the water combined with sodium, as common salt, — a very harmless substance. But inland wells and springs do not usually contain much salt, unless this has been derived from drains or cesspools; hence the presence of large quantities of chlorine is always a suspicious circumstance, because it indicates possible contamination. Croton water, when analyzed by Dr. Chandler in 1870, contained only one fourth of a grain of chlorine, equivalent to four tenths of a grain of chloride of sodium to the gallon.

It is seldom difficult to distinguish very bad water from very good water by chemical analysis, but there is, unfortunately, much doubtful territory which lies between the two. Water may be bad, yet not very bad, or good without being very good, and it is difficult to draw an exact line between these.

WATER GAS.

When steam is brought in contact with incandescent coal or coke, it is deprived of its oxygen, which unites with the carbon, forming carbonic oxide, and the hydrogen is liberated. If the mixture of these two gases is brought in contact with the vapor of naphtha it acquires illuminating properties, and is the illuminating gas which is now manufactured on such an extensive scale in New York and many other large cities.

The first successful attempt to manufacture this gas was made by Michael Donovan, who obtained a patent for his process in 1830. Soon after, Jobard, a Belgian, obtained a patent. Then followed Selligue, Lowe, and others.

The process in most general use now is named after its inventor, Tessié du Motay, and is the one employed by the Municipal and New York gaslight companies in New York city. The operation is conducted as follows: —

The gasogens in which the water gas is generated are arranged in pairs along the main pipe, which passes through the centre of the building. These gasogens consist of vertical furnaces, constructed of iron and lined with fire brick, and have a capacity of about ten tons of coal. In the lower portion on each side is a row of doors for the removal of cinders; on the top are two large openings for the introduction of coal, and a standpipe, which not only extends over to the main pipe, but has a vertical extension, the end of which can be opened or closed by means of a lid.

Through the centre of the furnace is a fire-clay partition, which extends nearly to the top, and in this is a coil of iron pipe. In working, a quantity of wood and coal is introduced into the gasogens; the doors are luted and the coal openings on the top closed, but the upper end of the standpipe is allowed to remain open to serve as a chimney. The blast is turned on till the wood is all burnt up, and judging from the color of the flame issuing from the standpipe the mass of coal has become incandescent. The blast is then shut off, steam is let in, and the lid of the standpipe is closed. The steam, which is generated in immense boilers at a high pressure, enters the coil of pipe contained in the fire-clay partition, where it is superheated, and then enters the mass of incandescent coal through a row of openings just above the grate bars. When the steam comes in contact with the red-hot coal, the following chemical reaction takes place: $H_2O+C=CO+H_2$. Besides the carbonic oxide and hydrogen, some CH_4, CO_2 and H_2S are formed, and possibly other gases resulting from any impurities which may be contained in the coal. The pressure caused by the generation of these gases forces them up the standpipe and over through a water seal into the main pipe; from here the gas enters a small holder, which acts as a governor, causing a steady flow of gas into the carburetters. The carburetters, which are situated at some distance from the gasogens, consist of ten or a dozen shallow trays, arranged one above another and surrounded by a steam jacket. A slow stream of naphtha, about five gallons to the 1000 cubic feet of gas, is allowed to run into the top one; when this gets full it overflows through a small pipe into the next lower, and so on. The heat of the steam in the jacket keeps the naphtha evaporating, and the vapors are taken up by the gas, which enters at the bottom, and after passing back and forth over the trays goes out at the top, and from thence to the retorts. These are about twenty feet long, of the same shape and arranged in the same manner as those used in the manufacture of coal gas; and they have perforated partitions across them in order to retard the flow of gas. These retorts are kept at a red heat. The gas enters at one end through pipes provided with valves for regulating the quantity, and passes out through a standpipe at the other end. The object of passing the gas through these retorts is to "fix" the naphtha vapor so that any lowering of the temperature will not cause a condensation of the illuminating constituents. In order to determine how well this is being accomplished the following simple test is used, which was patented in 1877 by Mr. H. C. Bowen: A slip of white paper is held in front of a small stopcock attached to the standpipe; on opening the stopcock a small stream of gas strikes the paper, causing a stain, from the color of which the workman is enabled to decide whether the temperature of the retort is right. A brown stain is desired; if it is too dark it indicates that the temperature is too high, and more gas is let in; while if it is too light in color the reverse is the case, and some of the gas is turned off.

From the retorts the gas goes to the exhauster, which forces it through the condensers, scrubbers, purifiers, meters, etc., into the holders, where it is stored till distributed. The process of condensing, purifying, etc., is essentially the same as that employed for coal gas, the impurities being about the same, with the exception of ammonia, which is seldom found in water gas.

Water gas as it comes from the gasogens, and before it is enriched with naphtha vapor, has a specific gravity about one half that of atmospheric air, with quite a strong odor, and it burns with a non-luminous flame, producing an intense heat. It consists of about equal parts of carbonic oxide and hydrogen, some marsh gas, carbonic acid, and various other impurities from the coal.

After being enriched and purified it has still a strong odor, and has a specific gravity of about 0.66 compared with air. Its illuminating power differs with the amount of naphtha used, generally ranging from twenty-five to thirty candles. It is more combustible than coal gas, requiring less oxygen to burn it, and therefore should not have as deleterious an effect upon the atmosphere of a room in which it is burned.

When a mixture of water gas and air is exploded, the explosion seems to take place more slowly than in the case of coal gas and air, exerting a steadier pressure with less shock, as is shown by windows being blown out without breaking the glass.

The following is an analysis made by Mr. E. G. Love, city gas tester of the gas furnished by the Municipal company of New York city: —

Hydrogen	26.25
Marsh gas	28.91
Carbonic oxide	27.12
Illuminants	15 80
Nitrogen	1.92
	100.00

It is very generally known that water gas can be made more cheaply than coal gas, although both sell for the same price, because their luminous powers are about the same. When electricity shall displace gas for illumination, there will still be a field for water-gas as fuel. As the enriching process can be omitted, the price can be reduced so that it will be as cheap as coal.

A. P. H.

INDUSTRIAL MEMORANDA.

The Wire-Netting Trade in England. — A London exchange says: The wire-netting trade is one of large proportions, which are, moreover, yearly increasing. It is estimated to amount to about £200,000 ($1,000,000) yearly, wire netting being used for a wonderful variety of purposes. Lots of ten and twenty miles of it go out to Queensland in execution of one single order to fence the great sheep-runs in that colony against kangaroos, which are most destructive to the herbage on which the sheep feed; and, again, quite as large lots go to New Zealand to fence out the rabbits and hares,

which are in a similar manner destructive to the corn crops. In this country, too, wire netting is very largely used in protecting young plantations from the ravages of hares and rabbits, especially in hard winters, when they can find nothing better than young bark for their food. It is also much used in spring and summer for keeping rabbits and hares from eating up young corn crops. Since the Hares and Rabbits Bill, too, has become law, rabbit warrens of several acres in extent are being fenced in with it on many estates. And then there is "the very latest" use of making lawn-tennis nets of wire netting. It is also useful for poultry inclosures, aviaries, and indeed every one wonders, who knows anything about the trade, where all the wire netting goes to. It need surprise no one, therefore, that in so extensive a trade there should be found some dishonest dealers.

A Filler for Porous Hard Woods. — The following is from *The Coach Painter:* Use boiled oil and corn starch stirred into a very thick paste. Add a little japan, and reduce with turpentine. Add no color for light ash. For dark ash and chestnut, use a little raw sienna; for walnut, burnt umber and a slight amount of Venetian red; for bay wood, burnt sienna. In no case use more color than is required to overcome the white appearance of the starch, unless you wish to stain the wood. This filler is worked with brush and rags in the usual manner. Let it dry forty-eight hours, or until it is in condition to rub down with No. 0 sandpaper, without much gumming up; and if an extra fine finish is desired, fill again with the same materials, using less oil, but more of japan and turpentine. The second coat will not shrink, it being supported by the first coat. When the second coat is hard the wood is ready for finishing up in any desired style, or to any degree of nicety, by following the usual methods.

Making Brickwork Impervious. — According to the *Industrial World*, to make brick masonry impervious to water, there may be employed two washes or solutions for covering the surface: the one castile soap and water, the other alum and water; the proportions being three fourths of a pound of soap to a gallon of water and a pound of alum to four gallons of water, both being well dissolved. The wall must be perfectly clean and dry, and the air at least fifty degrees Fahr. The soap wash should be laid on boiling, with a flat brush, and so as to form no froth. After remaining twenty-four hours to become hard, the alum wash is applied in the same manner, but at the temperature of sixty to seventy degrees. After another twenty-four hours a second soap wash is put on, this being repeated until the walls are impervious.

Rapid Bridge-Building. — A rapid piece of work was done lately at Bucyrus, O., by the Pittsburgh, Fort Wayne, and Chicago Company in replacing with an iron bridge an old wooden one. A scaffolding was first erected next the old bridge, and the new structure put together on it. Then, all being in readiness and every part in place, the old bridge was removed and the new placed in position. This was accomplished in two hours and fifteen minutes. At 12.30 the last train crossed the old bridge, which the workmen immediately commenced to remove. Then the new structure was gradually drawn into permanent position by means of two large windlasses, one placed at each end of the bridge, and each worked by four men. This operation occupied eighteen minutes. Then the connecting rails were laid, the roadway filled in firm, and at 2.45 the first train passed over the new bridge.

How Sleigh-Bells are Made. — It has no doubt been a mystery to many how the iron ball inside of sleigh-bells got there, and it is said to have taken considerable thought on the part of the discoverer before the idea struck him. In making sleigh-bells the iron ball is put inside a sand core just the shape of the inside of the bell. Then a mould is made just the shape of the outside of the bell. This sand core, with the jinglet inside, is placed in the mould of the outside, and the melted metal is poured in, which fills up the space between the core and mould. The hot metal burns the core so that it can be all shaken out, leaving the ball within the shell. Ball valves, swivel joints, and many other articles are cast in the same manner.

Agriculture.

INSECT PESTS.

The present season is distinguished for the variety and large numbers of insects which have been at work upon leaf and fruit, much to the annoyance and loss of farmers and gardeners. The most troublesome insect, which has appeared in vast numbers in the Eastern States in the past three or four years, is what is popularly known as the "rose bug," a filthy, voracious insect, which is doing for our grape-vines, peach-trees, etc., what the potato beetle is doing for the tubers. This pest has thus far been able to continue its ravages unchecked, as no device for his destruction has proved successful. The objective point towards which he centres in the vineyard is the tender blossom of the vine, and here he works rapid destruction to promised fruit. We have tried every method to exterminate the bug, but without satisfactory success. All forms of vegetable and mineral poisons have been experimented with, and we have found that, while it is not difficult to kill the bug, he cannot be reached without at the same time destroying the fruit blossom. During inflorescence the grape is specially tender and sensitive to external agents, even if they are not poisonous, and hence it is difficult to destroy the insects and save the fruit. The present season, we resorted to the expedient of covering the vines with mosquito netting at considerable cost, but this proved a failure, as, somehow, the bugs found their way through the covering. In a portion of the vineyard the vines were removed from the supports, and laid upon the ground, resting there about two weeks. These vines will afford about half a crop of fruit. This method we recommended in the Journal several years ago, and it has proved the only effective method we have tried. The vines must be laid prostrate and pressed a little, to bring every branch as near the earth as possible. The enemy appears to be either too stupid or lazy to hunt far for his food, and hence the under blossoms escape. The rose bug, besides, is an insect which delights in hot sunshine, and consequently the cool earth is not a favorable foraging locality. Laying the vines does not seem to injure the blossom or retard the growth of the fruit, and as no better method is afforded than this to save even a portion of the crop, we shall continue to follow it.

JOHN BULL "ACCEPTING THE SITUATION."

John Bull hates to change his ways and habits, but even his conservatism can yield to steady pressure — on his pocket. The competition of Brother Jonathan in his meat market nettled him a good deal at first, and he tried various tricks to get rid of his new rival; but American meat has proved to be as good as the best Scotch, and so long as it is to be had at a lower price the people will buy it. Our cereals, also, are spoiling the best laid plans of the British producer, and he sees that the thing is sure to go on from bad to worse, so far as he is concerned.

Under these circumstances, John perceives that his best policy is to turn his agricultural talent and facilities in new directions, where competition is not to be feared, or certainly not at present. *Punch*, who with all his nonsense is a good deal of a philosopher, indicates this tendency in the following: —

DIARY OF THE BRITISH FARMER OF THE FUTURE.

Monday. — Hard at work in the mulberry plantation. Consulted the Government Inspector about the threatened plague among the silk-worms.

Tuesday. — Got in the rose harvest. Prepared the stills for the distillation of next year's otto.

Wednesday. — Spent the day among the imported grapes, superintending the mixture of native perry and cider with Peninsular produce.

Thursday. — Tried my new process for milking by machinery. The cows, to my satisfaction, seemed readily accustomed to the noise of the apparatus.

Friday. — Took a ride through the ground I still reserve for the growth of oats and barley. The straw counts for something, but I think I shall put the soil to a more profitable use next year.

Saturday. — Went up to the county town to do some marketing. Brought home next week's stock of foreign flour and meat for home consumption.

Sunday. — Drove to church. Spent the afternoon in writing to my sons, now settled as old-fashioned British farmers in America.

That is clearly what John had better do — buy "foreign flour and meat for home consumption," if he can buy them cheaper than he can raise them, and set himself to raising such special crops as he can find a profitable market for, even if it be roses for the distillation of the otto. He need not reckon his ancient occupation as gone merely because the old standard products no longer "pay."

Mr. James Caird, who is high authority on agricultural matters, takes similar ground in a recent letter, from which the following is an extract: —

"The introduction of foreign meat and cereals is of immense benefit to the consuming classes of Europe. American statesmen believe they are rapidly gaining control of this trade, and can maintain it even at lower prices. It must be met by the production here of articles which will not bear long storage or carriage, such as milk, fresh butter, early vegetables, meat, hay, straw, potatoes, and the sugar beet.

"The drain of agricultural labor and capital to the United States and Canada, which has already commenced, and which nothing can prevent from continuing and increasing, will alter the existing conditions of agricultural property in England. Our agriculture must adapt itself to the change, freely accepting the good it brings, and skilfully using the advantages which greater proximity to the best market must always command."

That is only another way of putting the lesson that *Punch* reads the British farmer, and the signs of the times plainly show that the counsel is beginning to be appreciated and accepted by the somewhat stolid but really intelligent and "practical" personage to whom it is addressed.

SEEDS AND CUTTINGS.

MILK AND WOOL. — From extended observations on sheep that are tended for their milk, M. Tayon finds that the production of wool is in an inverse proportion to the production of milk. The sheep yielding most milk, and having four or six teats, are almost entirely without wool. The wool occupies but a small surface of the body. It disappears on the whole of the head, the neck, the breast, and the abdomen; also on great part of the legs, and in the bends of the hams. All these parts have merely short hairs. The skin of the teats has, on a very variable surface, special hairs directed upwards, and related to the activity of the lacteal glands.

BLUE MILK. — With regard to the blue color sometimes acquired by milk, Herr Hansen says milk becomes blue only before complete coagulation. Light and heat have little influence on development of the pigment bacteria; but access of oxygen is indispensable. If the surface of the milk be covered with a layer of oil to keep off oxygen, the development of the blueness is stopped. With the microscope, one finds in milk turning blue partly mobile bacteria of rod-shape, rapidly multiplying by division, while they yield a blue matter like aniline.

IS IT USELESS TO SHOE HORSES? — In a recent number of *Fraser's Magazine* there is an article by Sir George W. Cox, in which he estimates that the English custom of horse-shoeing costs the nation annually as much as forty-five million dollars, which might be saved if the horses were allowed to go unshod. He quotes authorities from Xenophon, who marched his horses unshod from Cunaxa over the Armenian Highlands to the walls of Trebizond, down to the "free lances" of the present day, and contends that it is safer, cheaper, and better to let horses go unshod over the hardest roads, and especially in the slippery streets of London. He estimates that over twelve million dollars would be saved in farriers' bills alone; and he calculates further that the working life of a horse would be trebled by the change, so that a horse which is now worn out at twelve years would live to twenty-six. The figures seem somewhat startling, and have hardly been sufficiently proved to be trustworthy. Meanwhile, it is said that a medical man in Waterbury, Conn., has not put shoes on his horses for two years, driving them winter, spring, summer, and autumn with bare feet without any trouble. The doctor's theory is that nature has provided for the horse; that a horse can travel over all kinds of roads; that the hoof will be moist; and that the frog coming to the ground keeps the hoof properly spread, and free from founder and other diseases.

ELM-WOOD. — A Western journal says: The use of elm-wood for various purposes is claiming the attention of manufacturers. The elm marketed is known as the "gray elm." Elm of any kind is rightly designated when it is called "tough," and tough it is, after the manner of tough leather. Its grain is not straight and easily separated, like oak or some other woods, but is interwoven, gnarled, knotty, and tough, as any one may learn who attempts to cut it. The elm in use is the water elm, found in high places. Until lately it was let alone and considered useless, but any farmer where elms grow knows the value of elm. When a new axe-handle is wanted, he does not buy the checky and cross-grained helve manufactured to wear out speedily, but makes one by his own handiwork from an elm limb. Such a helve will outlast a dozen of the machinery-cut kind. For all kinds of farming implements elm is particularly desirable, as well as for wheel stock and any contrivance that requires strength. One firm is said to be supplied with a half million feet of elm. The wood is coming into general use, and is a valuable addition to our hard-grained woods.

A NOBLE TREE FERN. — The London *Gardeners' Chronicle* gives the dimensions of a specimen of *Cyathea medullaris* which is one of the principal ornaments of the temperate greenhouse at the Kew Gardens. This plant was a gift to the gardens by the late Prince Albert in 1858. The total height is twenty-eight feet six inches; height of stem, twenty feet six inches; length of frond, fourteen feet. At three feet from the ground the stem measures twenty-eight inches around, and the circular space covered by the frond is twenty-five feet in diameter. "In New Zealand this species is the Korau, or Mamaku, of Maori tribes, who, after baking in their ovens the sago-like pith of the stem, find it very good and nourishing eating."

THE ISLAND OF JERSEY. — We find the following paragraph in an exchange: —

"The Island of Jersey contains but seven square miles of territory. Deduct the rocks and waste land and the space required for its 60,000 inhabitants, and probably not more than five square miles will remain. Yet on this limited territory over 12,000 cattle are maintained. The ability to do this the *National Live Stock Journal* ascribes to the high cultivation of various sorts of grass and roots, particularly the luscious, nutritive parsnip, which assists in adding such fine flavor and rich color to the butter made from these Jersey cows."

According to good authorities, Jersey contains 39,580 acres, or more than sixty square miles. The cultivated area is said to be about 25,000 acres. The population is about 57,000, over 30,000 of whom are in the town of St. Helier. Neither the people nor the cows are so badly crowded as the above statement implies.

WORMWOOD AS AN INSECTIFUGE. — M. Poyrot, having observed that the immense tracts of wormwood (sagebrush) upon the American plains are free from insects of every description, is experimenting with the plant as a preventive of phylloxera. He finds no difficulty in cultivating the wormwood, and he proposes to mix the stalks with manure, or simply bury them in the ground in the neighborhood of the vines. His suggestions have been sent to the Phylloxera Committee of the French Academy.

PRACTICAL HINTS.

A HINT ON ARRANGING FLOWERS. — *Vick's Floral Monthly* says: A new device for the arrangement of flowers consists of a piece of cork about a quarter of an inch thick, circular in form, and perforated with holes like the rose of a watering-pot. The diameter of the cork is made to correspond to the size of the saucer or shallow dish with which it is to be used. The cork floating on the top of the water supports the flowers, whose stems are inserted through the holes. For the display of small flowers and those having short stems this method seems well adapted; possibly it may be better than damp sand, though that is doubtful, but, as the cork may be preserved, it would always be at hand, and it might not be convenient sometimes to procure sand.

A SIMPLE FILTER. — A correspondent of the Baltimore *Sun* thus describes a filter which he says he uses with perfect success for all the water his family requires. It is a gallon glass funnel with a small piece of sponge in the bottom, on which rest half a dozen slender sticks to facilitate the percolation, these being also placed at intervals all around and beneath a piece of muslin a foot or so square. The muslin is filled with, say, a pint of closely powdered charcoal. Through this he filters the water. At first a little of the charcoal passes through, but it soon becomes a perfect filter.

FOR GARGET IN COWS. — Eight drops of tincture of aconite dropped on a piece of bread and mixed with the food at night. Next morning four drops more given in the same manner will generally complete the cure.

Boston Journal of Chemistry.

JAS. R. NICHOLS, M. D., *Editor.*
WM. J. ROLFE, A. M., *Associate Editor.*

BOSTON, AUGUST 1, 1881.

THE GREAT CRIME.

THE uppermost thought during the month in the minds of all in this great republic, and indeed throughout a considerable portion of the civilized world, has been the attempted assassination of our honored and much-loved President. The manifestation of sorrow has been deep and sincere, — a sorrow such as has been felt but once before in this country, and that when Lincoln fell by the hand of the assassin. Every one, not excepting even his strong political opponents, has been ready to acknowledge Mr. Garfield to be an honest, able, safe executive officer, a man of the people, and a fine representative of the class of American statesmen who have fought their way, single-handed and alone, to the highest positions in the republic.

We can add nothing to what has been said regarding this sad affair in the newspapers; nearly every feature and incident has been discussed, even to the minutest detail. Aside from the general facts brought to notice, the scientific aspects of the case have been remarkable and worthy of note. In them we see illustrated forcibly the important relations of science to every event in life. This relationship is displayed in the event, not only in strictly surgical or medical directions, but in many others, some of which are apparently remote in their bearing. Chemistry is called in to answer the question as to the toxical effect of leaden bodies when maintained in contact with living tissues, and also as to the precise propulsive energy of a certain number of grains of gunpowder exploded behind a ball in a pistol of known calibre. Chemistry also supplies curative agents, some of which were unknown at the time of the death of Lincoln. The highly volatile agents which, in the form of spray, have been projected upon the wound to allay inflammation, and some of the antiseptics and anodynes used, are the products of quite recent chemical research. If this event had occurred twenty years ago, the bulletins issued by the attending physicians would have contained no statement regarding the exact temperature of the body of the patient. No means were then at hand of gaining this knowledge, and, indeed, its importance in diagnosis and prognosis was not understood. The devices for cooling the room in which the sufferer is lying, by the evaporation of liquids, are the results of scientific study, and the rests and supports provided for him spring from the activity of the inventive faculty in recent times.

In order to determine the exact location of the ball, a party has proceeded to experiment in pistol shooting, a dead body being the target. Charges of gunpowder corresponding with that used in the pistol of the assassin, firing at the same distance, and aiming at parts corresponding with the seat of injury to the President, it was thought, might afford some clue to the location of the ball. Every device and appliance known to science has been brought into requisition in this deplorable case, to save the life of the President and to ameliorate or assuage his sufferings.

May the efforts made to restore him to health be successful, is the wish and prayer of millions, upon this and other continents of the world.

AIR-CURRENTS IN DRAINS.

It is an important question in sanitary science whether the air of drains, charged with vapors and small organisms, moves upwards or downwards. Herr von Rozsahegyi has recently made experiments as to this point in Munich, using sometimes vapor of sal ammoniac, sometimes smoke from flames, sometimes sulphuretted hydrogen gas, as indicators of the direction of the air-motion, while the strength of the draught was measured with an anemometer. He finds that the motion of the air in the Munich drains is much more downwards than upwards. The draught in the lower portion of the drain system is stronger than in the upper. Upward currents occur but very seldom, and they are limited to very short portions of the drains. The prevailing direction of the wind has no marked influence on the direction and velocity of the air-current in drains. The temperature of the drain-air was, on an average, 3.2° to 5.6° C. lower than that in the open air, but the observed air-movements in the drains are not explained by this. Where house-drains join street-drains the air goes oftener outward than inward, and this partial movement is also independent of the prevailing wind direction. The outward and inward motion at such places is not constant, but variable. Through these junctions, when near the houses, an exchange of air may occur between one house and another, if efficient water-traps are wanting. The predominant downward air-current appears to be due simply to the current of liquid matter. The experiments are to be repeated in winter, when the temperature in the drains is higher than in the open air.

PROFESSOR GAMGEE, OF "ZEROMOTOR" FAME.

The London *Chemist and Druggist* has the following capital notice of Professor Gamgee, to whose "zeromotor" we referred in the Journal for June: —

A good many people in the London trade will remember the handsome, sanguine, and fertile-brained Professor John Gamgee. The professor first came to the front in the veterinary line, and accomplished certain achievements in regard to the cattle plague, and, we believe, founded a new college, which completed its career some years ago, leaving but little trace of its usefulness behind except the title with which its principal was decorated for life. This means of activity having dried up, the professor next engaged in experiments which resulted in the discovery of the wonderful antiseptic virtues of chloride of aluminium, and on which he based his commercial exploits with chloralum. That product went through a good many ups and downs, but for a time at least a great trade was made in it, and the professor, we understand, sold out to a military capitalist when the tide was high, and set his genius to work in another direction. Financial agency occupied him for a time, with what success we do not know, but just as we had forgotten him once more his name reappeared as the inventor of a new process for making ice, and the Glaciarium on the Thames soon arose as a practical illustration of his process. We met the professor about this time, and congratulated him. He was calmly confident and triumphant. The day of small things had passed away, and marvellous was to be the progress of the new system. But the Glaciarium melted, and the professor dived again. We thought of him the other day as we watched the seals at the Brighton Aquarium, and we were wondering at what part of the surface he would next show. Recent American papers answer the problem. "Professor John Gamgee, of London, now residing at Washington," appears as the inventor of a "thermo-dynamic engine," otherwise called a zeromotor, which will economize most of the ninety per cent. of the dynamical loss incidental to the use of steam. It is proposed to use ammonia, and at ordinary temperature convert it into vapor. The expansion is to work the piston, and the working of the piston is to convert the vapor back into liquid form again. The liquid is to find its way round again, and so a perpetual cycle is to be maintained. We always felt confident that when perpetual motion was discovered, Professor John Gamgee would be the hero thereof.

GOOD WORDS FOR THE JOURNAL.

The following note, sent to us by the superintendent of a public reading-room in a neighboring city, is so pleasant a testimonial that we venture to publish it: —

I desire to have you know how valuable the Journal of Chemistry is, and how highly it is esteemed by the frequenters of the public reading-room of this city. There is, it seems to me, no more certain test of the interest taken in a journal received at a library or reading-room than to have it constantly inquired for by the patrons, and this is the case with your journal. The time when the successive numbers ought to be received is kept in mind, and it is waited for with impatience by our readers. Many of our young men, I think, read it *entirely through*, and, for myself, I will say that I always find it specially interesting and instructive. I thank you, in behalf of our readers, for the Journal of Chemistry, and for your kindness in sending it to us. M. P. S.

SANITARY RULES FOR PUBLIC BUILDINGS.

The following rules, which have been officially promulgated in England for the construction of all buildings erected by her Majesty's Office of Works, are worth reprinting on this side of the Atlantic, as covering some of the most important points in sanitary architecture: —

(1.) All water-closets and urinals shall be constructed so that one wall, at least, of such closets and urinals shall be an outer wall of the building.

(2.) All soil pipes shall be carried outside the building, and ventilated by means of pipes leading the foul gases above the highest point of the building; such pipes to be carried to points removed from chimney-stacks.

(3.) Separate cisterns shall be constructed for the water-closets and for the general purposes of the building. No tap or "draw-off" shall be affixed to any pipe communicating with a cistern supplying a water-closet or urinal.

(4.) All waste pipes and overflow pipes of cisterns shall terminate in the open air, and be cut off from all direct communication with drains.

(5.) Great attention shall be paid to insuring thorough ventilation in all rooms. Rooms so high that their ceilings shall be more than two feet above the top of the windows, corridors, staircases, and other open spaces shall be specially ventilated, so as to prevent the accumulation of stagnant air.

(6.) All main drains should, where practicable, be formed outside the building. In the event of its being necessary to carry a main drain underneath a building, it must be trapped immediately outside the main wall, and a ventilating pipe must be carried from that point to the highest part of the roof, as under Rule 2.

HONOR TO THE HAMMER.

"By hammer and hand all arts do stand" was the ancient motto of mechanics' guilds or associations, and taking this as a text the London *Economist* preaches the following little homily to the workingman and his friends: —

The hammer is the universal emblem of mechanics, — those skilled in uniting and binding together of materials. With the hammer are alike forged the glittering sword of contention and the dusty ploughshare of peaceful agriculture. Its workmanship ornaments the trapping of war, and nails the olive branch of peace above the gate. In ancient warfare it stood preëminent, apart from the instruments it wrought and formed. The old battering-ram of the Greeks was nothing but the rude conception of a huge hammer. In heathen mythology it was always the symbol of might and strength. It was the sole weapon of the dreaded god of thunder, Thor, the mighty rival of Odin. His hammer was fashioned by cunning dwarfs, and possessed the wonderful property of returning to his hand after being hurled. To the heathen Teutons the sign of the hammer was analogous to that of the golden cross of Christianity. In the hammer lies the wealth of a nation. By it are forged the ponderous engines that almost shake the world, and the tiny needle which unites alike the costly silks and satins of a queen and the rough homespun of a laborer.

The hammer, too, is no partisan. It is an instrument of the savage and the civilized. Its merry clink points out the abode of industry and labor. Its handle is extended, inviting all to grasp, and with its unyielding head, by the help of a strong arm, forges happiness and prosperity. It is, in fact, a domestic deity presiding over the aspirations of wealth and ambition. Not a stick is pointed, not a house is built, a ship floats, or a carriage rolls, or a wheel spins, or an engine thunders; not a press speaks or a bugle peals, a spade delves, or a banner floats, without having endured the blows of the hammer. So it instructs and teaches us that great ends and large results can only be accomplished by good, hard, vigorous blows; that if we would attain usefulness, and reach the full perfection of what we are capable of becoming, we must not shrink back from the hardships, buffetings, and hard knocks of life, but early learn to cultivate the power of patient endurance.

METEOROLOGY FOR JUNE, 1881.

The sum of my observations on the weather for the past month has been as follows, namely: —

Average Thermometer.		Lowest.	Highest.	Range.
At 7 A. M.	58 57°	41°	69°	28°
At 2 P. M.	67.63°	48°	81°	33°
At 9 P. M.	58 80°	46°	70°	24°
Whole month	61.67°	41°	81°	40°
Last 18 Junes	66.40°	61.67° in 1881.	70.44° in 1865.	8.77°

The average barometer for the month was 29.853 inches; the lowest 29.56, on the 29th, and the highest 30.08, on the 7th, a range of .52 of an inch. The sum of the daily variations was 3.44 inches, giving an average daily movement of .115 of an inch. The average height for the last nine Junes has been 29.911 inches; the lowest, 29.853; the highest, 29.957, — a range of .104. The average for the last eight entire years, 29.919, showing June to be very nearly an average month.

The face of the sky in 90 observations gave only

46 fair, but 17 cloudy, 16 overcast, and 11 rainy, — another cloudy, cool, and wet month, remarkably so for the usually beautiful and delightful month of June. The amount of rain was 4.90 inches, while the average for the last thirteen Junes has been only 3.10 inches. The lowest amount was zero in 1873, and the highest 5.30 in 1875. Two and three fourths inches fell on the 10th, very unusual for June. The remaining 2.15 inches were well distributed through the rest of the month. There was no thunder during the month, and but a few slight flashes of lightning, occurring on the 28th.

The direction of the wind gave an excess of 18 northerly and 32 westerly observations over the southerly and easterly, indicating the average direction to be W. 29° 25′ N., or approximately N. W. by W. This is the fourth time in thirteen years that June has had an excess of northerly winds, and this the largest of the four. The average direction for the last thirteen Junes has been W. 19° 35′, or nearly W. S. W.

In general, the past month has been distinguished from our usual Junes by a remarkable amount of cloudy, wet, and cool weather, being the coldest June in the past eighteen years, and the wettest in thirteen, with only one exception, that of 1875. This coolness has been caused, doubtless, by the large amount of cloudy, wet weather and excessive northerly winds; but what caused such winds, clouds, and rain it is not so easy to say. In 1875, with more rain, there was also more fair weather, and 34 more southerly observations of the wind, securing a nearly average temperature, 66.07°. The cool state of the weather the past month has checked the forwardness of the season, though vegetation has been vigorous, and the prospect of a large hay crop is especially encouraging, provided the weather shall be favorable for securing it.

I must not fail to notice our unexpected visitor, the comet, now passing through our northern sky, a beautiful and conspicuous object, though gradually fading in its retreat from the sun and the earth.

D. W.

NATICK, *July* 7, 1881.

EDITORIAL NOTES.

THE TUNNEL UNDER THE ENGLISH CHANNEL. — This long-talked of "bore" is now actually begun, the ground at the bottom of the shafts having been found so satisfactory that headings will be driven at once a mile from each side. These will be completed in about six months, and if their construction develops no unexpected difficulty arfurther treaty will probably be made for the prosecution of the work in both directions, until the headings meet in the middle of the Channel. The total distance is about twenty miles, and if the same rate of progress is kept up communication will be opened between the two shores in five years. The enlargement of the gallery to the requisite dimensions, the lining with brickwork, and the provision of necessary ventilating openings will consume some years more.

LIGHTNING-RODS. — A lecture was delivered lately at the Royal United Service Institution by Captain Bucknill, R. E., on the application of lightning-conductors to buildings and magazines. The lecturer, who has been employed in testing and inspecting a number of government conductors, especially drew attention to the following among other points: (1.) The necessity of using continuous conductors with the smallest possible number of joints, and these joints carefully soldered. (2.) The advantage of multiple points. (3.) The necessity of using larger earth connections than is now usual, and of making some of them deep and some shallow. (4.) The advantages of iron over copper conductors. (5.) The unreliability of the so-called safe circle advocated by some electricians. (6.) The advisability of providing a horizontal collecting conductor near the ground to connect the various earths with all the conductors, rain-water pipes, etc. (7.) The need of periodical inspection and of testing the conductors electrically when they are properly put up. The lecturer exhibited an apparatus for testing conductors, as well as samples of both copper and wire ropes. For general purposes he recommended an iron-wire rope six pounds to the yard, and three pounds per yard when it was carried over the house to two "earths" on opposite sides. The equivalent ropes in copper would weigh one pound and one half pound respectively, and cost about the same as the iron.

THE POLYSCOPE. — At a recent soirée in the Paris Observatory, M. Trouvé showed a live fish with its body lit up from within by his polyscope, a minute form of which, with conducting wires passing to the hands of the operator, the animal had been caused to swallow (comfortably, let us hope). The whole body became transparent in the dark, so that the vertebræ could be counted and all details examined. This instrument promises to have many uses. Among others it has already been applied, *La Nature* says, to show students the texture of the rectum and bladder; to facilitate extraction of a projectile at the back of the nose; to examine the stomach of a bull (in which a gastric fistula was formed); to lighting the interior of shells and cannon for examination; also to lighting powder magazines, in which case the reflector is enclosed in a triple envelope of glass.

"HAMLET" ON VACCINATION. — *Punch* gives the following parody: —

> To vaccinate or not, that is the question:
> Whether 't is better for a man to suffer
> The painful pangs and lasting marks of small-pox,
> Or to bare arms before the surgeon's lancet,
> And, by being vaccinated, end them. Yes,
> To feel the tiny point, and say we end
> The chance of many a thousand awful scars
> That flesh is heir to. 'T is a consummation
> Devoutly to be wished — Ah! soft you now,
> The vaccinator! Sir, upon thy rounds
> Be my poor arms remembered!

THE CRANBERRY IN ENGLAND. — The American cranberry, *Vaccinium macrocarpus*, is now raised with success at Ashburnam Park, Sussex. The vines in peat beds are healthy and vigorous, and fruit abundantly. With the same treatment that it receives here, the cranberry should be a good crop in England.

ATOMS.

FROM old manuscripts in the National Library, Paris, it appears that as early as 1639 the practice of vitriol-throwing was known; in that year the Duchess of Chaunes, while entering Paris, was attacked by five masked highwaymen, who "threw into her face a vial full of vitriol." — A writer in the *Country Gentleman* says he applied tar to young pear-trees as a remedy for wounds, and now he is anxious to know if a bigger idiot can be found this side of the Rocky Mountains. — Some Texas farmers are trying the experiment of importing from Russia a certain beetle indigenous to that country, which is represented as being very voracious, and living on grasshoppers, locusts, cotton-worms, and other destructive insects. — Pride in one's work is good, but the maker of surgical appliances perhaps went too far when he said his artificial arms were so real that, if they were vaccinated, he would warrant them to "take." — Iodoform is recommended by French authorities in doses of one third of a grain, in pillular form, four to five times daily, as a means for lessening the painful and spasmodic cough of phthisical patients. — Lord Denman, an ardent friend of domestic quadrupeds, rides about the streets of London behind a horse that wears spectacles; the animal was found to be near-sighted some time ago, but its owner has remedied this defect as successfully as if it had been his own eyes which were at fault. — C. René, of Stettin, is said to have made the discovery that if wood be exposed to the action of a heated current of pure oxygen it becomes proof against the action of moisture and of changes of temperature, and is especially adapted for the manufacture of musical instruments. — It is asserted that mineral oils are not to be recommended as lubricants, since they attack any india-rubber with which they may happen to come in contact. — During a series of experiments made under the auspices of the French postal authorities, Dr. Cornelius Herz succeeded in transmitting audible speech a total distance of 800 miles with the aid of his telephone system. — Silk damasks for curtains, etc., are now made by pasting a thin silk tissue upon cotton; india-rubber dissolved in petroleum is said to be used for the cement. —It is reported that the results of recent geological explorations made in Russia have shown that there exist in that empire phosphate deposits of sufficient magnitude to supply the wants of Europe for an indefinite period. — It is said that a speed of eighteen miles an hour was attained on the Siemens electrical railway at Berlin, but the authorities restrict it to nine miles an hour, the highest rate allowed for tramways, in which category this is officially reckoned. — An exchange, doubtless edited by a bachelor says: "A French engineer, after a series of experiments with a loaf of bread baked by a Vassar College girl, now announces that the project of tunnelling Mont Blanc is entirely practicable." — During the last session of the Illinois Legislature, Mr. Sumner introduced a bill which became a law, amending the act in regard to the incorporation of fire, marine, and inland-navigation insurance companies by authorizing such corporations to insure against loss by tornadoes, in addition to loss by fire, lightning, or either or any of said causes. — It is a curious fact that the Chair of Anatomy in the Harvard Medical School has had but three occupants in the ninety-eight years of its existence, namely, Dr. John Warren, Dr. John Collins Warren, and Dr. Oliver Wendell Holmes.

LITERARY NOTES.

The Treatment of Catarrh, Part II., by Dr. T. F. Rumbold, of St. Louis, contains the Hygiene and Treatment of Catarrh. The author gives directions for cleansing the nasal passages and ears, with illustrations of many new forms of apparatus devised by himself for treating catarrh and allied diseases. There is much that is new, but whether better or not than the old the practitioner must ascertain for himself. There is much to commend it both to the profession and the public, being the result of over twenty years of continuous labor, observation, and study.

Many of our readers will hear with pleasure that Dr. Beard's new work on *American Nervousness* is now ready. The author treats, in this volume, of the causes and consequences of that form of nervousness, or more properly nervelessness, which predominates in this country. It may be some consolation to know that "nervousness aids longevity, and that the professional and business men of America live longer than any other great class of people in the world." Dr. Beard also attributes to it the entrancing and phenomenal beauty of the American girl, which, he says, has no precedent, in recorded history, at least. On the whole, the author takes an encouraging view of the typical American of the future.

We have received a *Handbook of Systematic Urinary Analysis*, chemical and microscopical, by Frank M. Deems, M. D. The author has condensed into 30 small pages nearly all that a physician needs to know in order to test urine. The insertion of a few cuts, representing the microscopic appearances of uric acid, oxalates, pus, etc., would, we think, be an improvement.

The *Naturalist's Leisure Hour*, published by Prof. A. E. Foote, Philadelphia, shows marked improvement. The April number contains an illustrated article on the Rocky Mountain Locust, by A. S. Packard. The subsequent numbers contain illustrations of the wonders of the Yellowstone region. All who are interested in natural history and mineralogy should send for specimen copy.

Science begins its second annual volume with the number for July 2, 1881, and celebrates the event by adopting a bright green cover. Professor Young contributes an article on the comet, and Professor Dolbear's new telephone is fully described in the number before us.

A correspondent who asks whether there is any recent and reliable work on the manufacture of glucose may have seen that his question is answered by the advertisement of Messrs. H. C. Baird & Co. in the last number of the JOURNAL. Frankel's *Practical Treatise on the Manufacture of Starch, Glucose, etc.*, undoubtedly covers the ground, and is fully up to the times.

Medicine and Pharmacy.

THE FEEDING OF INFANTS.

THE London *Practitioner* reprints the following "leaflet" prepared for popular use by Christopher Elliot, M. D., physician to the Bristol Hospital for Sick Children and Out-Door Treatment of Women: —

Diet for First Three Months. — What is the right food for a young infant? The only answer is *milk*. Nature tells us so, and chemistry and physiology explain how it supplies all the elements of nourishment the human body needs. Milk is got from various sources, but *mother's milk* is to be infinitely preferred for a young babe to all other kinds, and provided that the mother is moderately strong it should be the only food given until the first teeth are being cut, or until the infant is at least three or four months old. For the first month an infant should be put to the breast every two hours, and after this the interval should be increased by a quarter of an hour every week, until at length he has it about every *four* hours. It is important that the baby be fed *regularly*, and the habit of some mothers giving him the bosom every time he cries cannot be too strongly condemned. He cries, not because he is hungry, but because he is in pain; his stomach has been overloaded; and to soothe his suffering by offering him the breast is as absurd as trying to extinguish a fire by pouring oil upon it. A better plan is to let him go without a meal, put him into a warm bath, and give him a little cold water if thirsty.

Diet for a Baby from Three to Six Months Old. — When the infant is three or four months old, and occasionally even before then, artificial food may be necessary. If a good wet-nurse cannot be found, cow's milk, condensed milk, goat's milk, ass's milk, etc., are given, but as the two first are more easily obtained they are mostly employed. *Cow's milk* should be *pure* and *fresh*, and taken from *one* cow, if possible. Mixed with sugar and water and a pinch of salt, and given through a *clean* feeding-bottle, it is a valuable addition to the mother's milk. It should be prepared thus: Dissolve a lump or two of white sugar and a small pinch of salt in a pint of warm water, and add to this a pint of fresh, *unboiled* milk. This food to be given night and morning, but not oftener when the baby is being suckled as well. If the above food disagrees, as it sometimes will, omit the sugar, or change the proportions to two parts of water and one of milk. If the milk purge violently or cause offensive motions, *boil* it, or put one or two tablespoonfuls of *lime-water* into each bottle of food. In the case of delicate infants, if you can get it, add a tablespoontul of cream to each pint of milk. When good cow's milk cannot be obtained, *condensed milk* becomes a valuable substitute.

Diet for a Baby over Six Months. — When the infant is six or seven months old farinaceous food may be given; that is when he begins to cut his teeth, for until that period it is unadvisable to give him any farinaceous food. It will only prove injurious, because, as Dr. W. Roberts shows, the ferment in the saliva or spittle, which digests starchy matters effectively, does not exist in sufficient quantity until the infant is six or seven months old.

The following are useful foods, any one of which the mother can safely adopt: —

(1.) Boil the crumb of bread for two hours in water, taking care it does not burn; then add a lump of sugar, a pinch of salt, and pour a little new milk on it while boiling hot. (2.) Cut thin slices of bread into a basin, cover the bread with *cold* water, place in an oven to bake; when sufficiently baked take it out, beat the bread up with a fork, slightly sweeten and pour on milk. (3.) Baked flour. Bake some biscuit flour in a slow oven until it is of a light fawn color; reduce it with a rolling pin to a fine powder, and keep it in a tin ready for use. Two tablespoonfuls to half a pint of milk boiled and sweetened. (4.) Boil a teaspoonful of powdered barley (ground in a coffee-mill) with a little salt in half a pint of water for fifteen minutes; strain, mix with half as much boiled milk, and add a lump of sugar. (5.) Scotch oatmeal. Prepare in the same way as 4. This food is especially useful for regulating the bowels when they have a tendency to become constipated. (6.) Ridge's or Neave's farinaceous food for infants. (7.) Revalenta Arabica, or lentil food. This is strongly recommended by Dr. Routh. (8.) Cadbury's cocoa essence, Fry's cocoa powder, or cocoa nibs. Dissolve a teaspoonful of either of the two first in half a pint of boiling milk and water (equal parts); of the *nibs* take one ounce, and boil it in a pint and a half of water for five hours, strain, and add new milk and sugar. Cocoa makes an excellent food for thin and wasted infants, who take it greedily, and soon improve in health.

These foods are to be given lukewarm through a nursing-bottle, which, with the mouthpiece, should be kept in a bowl of water when not in use. In hot summer weather test the food with a small strip of blue litmus-paper, which can be obtained at any chemist's shop. If the blue paper turns *red*, either make a fresh mess, or add a small pinch of baking soda to the food.

Diet for an Infant over a Year Old. — When the child is fifteen to eighteen months old, broths, the yolk of egg, bread and gravy, or well-mashed potato and gravy may be given once a day. If allowed much sooner they are likely to cause flatulence and sickness, and even griping and diarrhœa. When he is two years old small pieces of meat cut fine may be introduced in his diet.

Weaning. — When the baby is nine or ten months old he ought to be weaned. The way the mother can do this is by gradually giving him more artificial food and less and less of the breast, until at length he has it only at night, and finally not at all. If the mother's presence cause him to cry for it, she should sleep in another room, or go from home for a few days. Where the infant is delicate, weaning may be postponed till he is twelve months old, but to suckle him beyond that period is injurious both to mother and child.

THE PROGRESS OF SURGERY.

THE remarkable advance that has been made in surgery in our day is well illustrated in the following passages from a recent lecture by Professor von Nussbaum, of Munich: —

That great scholar, Phillips von Walther, asserted that it was an impossibility for any man to see the deeper parts of the eye. He founded this statement upon the fact that the eye is a "camera obscura;" it is like a chamber with one window, and this window, as seen from without, appears always black, and does not permit of the remote parts of the room being seen. No one disputed this statement of Walther; but scarcely was he laid in his grave when the ophthalmoscope was invented, and the deeper parts of the eye were explored with almost mathematical exactness. The first step was to reflect light into the eye by means of a mirror; then the silvering was removed from a small portion of the back of the mirror, and so, while the rays of light reflected from the mirror lit up the interior of the eye, the structures could be conveniently examined through the transparent part of the mirror.

Dieffenbach, the bold German operator, wrote, in 1842, "It is unjustifiable to cut into the abdominal cavity in order to take out a diseased ovary. The organism will not tolerate such interference." Dieffenbach had been dead only a short time when ovariotomy produced splendid results in England; and now Keith performs fifty successive ovariotomies with only one death. A very modest calculation shows that through the ovariotomies successfully performed in England, France, and Germany more than 30.000 years of life have been spared to the human race.

A few decades since it was considered that wounds of the intestine were invariably fatal; no one dared to put in stitches. Now the intestine is drawn out of the abdominal cavity, diseased portions to the extent of several inches are removed, and the healthy parts brought together. The bowel, carefully protected, is left outside the abdominal cavity for, perhaps, a few days, until it is soundly healed, and then it is returned into the abdomen. Thus it cannot now be affirmed with truth that wounds of the intestine are necessarily fatal.

It is not so very long since a suggestion, made by the surgeon Carl Theodor Merren, to remove cancer of the stomach was looked upon as "a beautiful dream of youth." However, Professor Czerny demonstrated practically, four years ago, that a person can continue to live after the whole stomach has been removed. He cut out the entire stomach, and stitched the œsophagus to the intestine, and the digestive functions were carried on very well, and the patient had good health.

CARBOLIC ACID FOR CARBUNCLES.

DR. J. T. WOODS, in the *Toledo Medical and Surgical Journal*, bears the following testimony to the value of the pure acid in carbuncle, thus confirming views that were expressed in October, 1878, by a correspondent of the JOURNAL: —

It is now about two and a half years since a patient presented with two carbuncles, one on the back of the head, the other below it, on the neck. They were of moderate size only, the upper one open in three places, while in the lower the skin was unbroken.

Having considered the various known properties of the carbolic acid, I determined to use it vigorously instead of inserting it in meagre quantity. I loaded my hypodermic syringe, and passing the point through the openings and into the sloughing mass in every direction, I completely saturated it with the pure acid and awaited results. In a minute the smarting disappeared, and with it all pain and all sense of soreness.

Emboldened by this result, I again charged my instrument, and thrusting it through the skin over the other carbuncle, in a variety of places, I soaked the whole carbunculous mass beneath the skin, enough of necessity escaping fully to bathe the borders, modify inflammation, and destroy any septic elements then developed. I waited, not without concern, and was delighted to learn in a few moments that all the pain and soreness were gone in this also. The skin over the mass became quickly white, hard, and dead, and in a few days detached, in the form of a slough, the interior mass also becoming rapidly loosened, only requiring the cutting of a few shreds to remove it, when the cavity was found to present a satisfactory appearance, and rapidly filled up, leaving an exceedingly small cicatrice. The remarkable feature in this case was that after the complete saturation of the carbunculous mass no pain occurred, my patient going about his ordinary labor without discomfort. It is now one year since I treated a very painful case, the same method bringing about similar results, the party suffering no

pain or even soreness after the lapse of one minute following the injection.

I would advise the use of the pure acid only, and to complete saturation. Dilution would increase, if not create, danger of absorption of the acid, converting a very simple procedure into a condition of great danger; and insufficient quantity would defeat the purpose for which it is used.

"PAIN-KILLERS."

Prof. A. B. Prescott, of the University of Michigan, in an interesting paper on "Nostrums," read at a State sanitary convention, and since printed in *The Physician and Surgeon*, thus refers to one of the more harmless kinds of these quack preparations, the "Pain-Killers:" —

Few of them are wholly inert, and most of them have a transient stimulant effect. Of *eight* of them subjected to analysis, six were found to contain the ordinary spirit of camphor, which every thoughtful mother keeps in the house; three contained ammonia, such as any hartshorn bottle would furnish; four were charged with red pepper; all had some alcohol; oil of sassafras was found in four of them, oil of turpentine in two of them, tincture of guaiac in two, chloroform in one, and myrrh in one. One of the most successful contained in a half-dollar bottle one and a half fluid ounces of soap liniment, with one half fluid ounce each of capsicum tincture, ammonia water, and alcohol, — in all, four articles of the United States Pharmacopœia. One that was sold at a dollar for a four-ounce bottle, by a Chinese doctor who had studied many years in the Celestial Kingdom, and who visited the towns of Michigan in a gorgeous car drawn by four horses, with a company of musicians and a lecturer, consisted of camphor spirit, lavender compound spirit, ammonia water, sassafras oil, and alcohol. One made and sold in Germany as Nature's Own Cure, a sure relief for one hundred and sixty-six different diseases, consists of red-pepper tincture, ammonia, and alcohol. Another, noticed since grouping the eight articles, is a Five-Minute Fragrant Pain Curer, that will quiet every ache within five minutes by an exact time-piece. It is a mixture of ether, glycerine, common salt, and water. A Golden Wonder, or Seven Seals, for all the ills liable to occur in this life, is a mixture of ether, chloroform, camphor, peppermint oil, red pepper, and alcohol. Nearly all of these articles are directed to be taken internally, as well as applied externally. Now almost every person would have some judgment as to how much of ammonia, or turpentine, or camphor, or ether, or strong alcohol, it would be safe to take at once, if to be taken at all, in seeking relief from a violent pain; but what judgment can anybody have as to a safe quantity of such talismanic articles as "Ready Relief," "Wizard Oil," or "Magic Master of Misery"?

THERAPEUTICAL HINTS.

To Prevent Pitting in Small-Pox. — A method commended in the *Gazette des Hôpitaux* is as follows: A mask is made of very pliable linen cloth, leaving apertures for the eyes, nose, and mouth. The inside of this is to be smeared with one of the following liniments: (1.) Carbolic acid, 4 to 10; olive oil, 40; and prepared chalk, 60 parts. (2.) Carbolic acid, 5; olive oil and pure starch, of each 40 parts. (3.) Thymol 2; linseed oil 40; and chalk in powder, 60 parts. The mask should be renewed every 12 hours. Compresses impregnated with one of these mixtures may also be placed on the hands, and on any parts of the face with which the mask does not come into exact contact.

Dissolving Salicylic Acid. — Dr. Squibb, in *Gaillard's Medical Journal*, says: "There is no way known to me whereby salicylic acid can be dissolved in water to any useful strength, and kept as free acid. When borax is used, a solution of any desired strength may be made. But a double salt is said to be formed, and therefore it is not a solution of the acid. The best plan that I know for getting the effect of the free acid is to take the amount of water and of acid desired, and then add bicarbonate of soda until solution is effected. This makes the solution of the acid in a solution of sodium salicylate."

Administration by the Nostrils. — Dr. Fernet stated at the Paris Therapeutical Society that, having observed, some years since, how infants who could not suck were fed in this way at the Direction des Nourrices, he had since frequently resorted to it with great advantage, and believed that it was far too little known and practised. The patient being laid on his back, with his chest and head slightly raised by pillows, the liquid is to be poured slowly into the back part of the nares by means of a very pointed spoon or other agent, and when it reaches the pharynx it induces a movement of deglutition. Adroitly performed, food may be given in this way as well as by the mouth. He has often used the method in apoplectic coma, and in the coma of infants suffering from tubercular meningitis. Medicines may be given in the same manner whenever the mouth cannot be employed for this purpose. M. Crequy observed that he has had recourse to this means, and in a maniacal patient found it very convenient to pass a very flexible caoutchouc tube as far as the velum, and connect the other end with a funnel containing the substance to be given.

Psyllium Seed in Constipation. — According to the London *Practitioner*, Dr. Guenau de Mussy in a French journal recommends psyllium seed in constipation, as well as *white mustard seed*, the use of which is excellent, or *flaxseed* in the natural state.

Psyllium is a species of plaintain, commonly called *fleawort*, because of the appearance of its seeds, which are quite small and very mucilaginous. A tablespoonful in half a glass of water is taken before dinner. He says that with a number of persons this method has proved as successful as with the Spanish lady from whom he learned it. In other cases, however, he was obliged to alternate with more powerful laxatives, such as aloes or rhubarb, so as to keep up the effects. It is probable that psyllium seed, like others of its kind, is not persistent in its effects, although in a number of cases it seems to have been so.

Raw Meat Juice for Irritable Stomach. — Dr. J. Hendree, of Colliersville, Ala., sends us the following note for the Journal: —

A month since I was called by a teacher eight miles distant to visit his child of eighteen months, in a deplorable state of emaciation from long and exhausting diarrhœa. The stomach retained nothing, and the father stated that, unless relieved, his child would starve to death. I gave him a bottle of Valentine's raw meat juice to try, promising to call next day, if desired, but heard nothing further until a month later, when I was called to the neighborhood to a child burned from the knees to the chin by its clothes taking fire. There was dreadful excoriation of the whole front of the body and limbs. After suitable dressing, as the stomach would not retain even a teaspoonful of water, I left a bottle of meat juice, and on the third day paid a second visit. I found the child recovering. The meat juice was retained and relished from the first. I called at the home of the first patient, on my return, and the mother showed me the child, perfectly well and running about. She stated that the meat essence was the first thing retained; it had all been used, and she was satisfied that it had saved the child's life.

Administration of Petroleum. — Dr. M. Milton, of Bradford, Pa., writes to the *Philadelphia Reporter*: "The many favorable reports of the efficacy of crude petroleum in chronic bronchial and lung diseases have caused the M. D.'s to give it a trial in these troubles. But I am informed that the patients soon revolt, on account of its nauseous taste and the disagreeable eructations it produces. Moreover, it resists almost all the formulas used in emulsifying cod-liver oil. I have recently used the medicinal oil, which is purified and deodorized by throwing it as a spray into steam, and then filtering; it is pleasant, palatable, and equally efficacious; it is simply the crude petroleum, deprived of its gases and unpleasant properties. We find it one of our most valuable medicines in coughs, colds, asthma, and all forms of chronic lung diseases. Evidence is not wanting to prove it our most valuable palliative and cure in phthisis pulmonalis. The medicinal oil is easily emulsified."

Black Walnut Leaves as a Remedy in Diphtheria. — Dr. C. R. S. Curtis, of Quincy, Ill., reports in the *Boston Medical and Surgical Journal* results of the local use of a decoction of leaves of *Juglans nigra* in diphtheria. The remedy was chiefly employed as a gargle, or applied with a swab to the throat and fauces. A poultice of the leaves was also resorted to in some instances. Dr. Curtis adopted the practice in consequence of the recommendation by Professor Nélaton (in his "Elements de Pathologie chirurgicale") of the *Juglans nigra* as a remedy in malignant pustule. The use of the gargle was unattended by discomfort, no patient objecting to it; and improvement in each instance was rapid, the œdema subsiding, the ash-colored spots disappearing.

Therapeutical Effects of Oxygen. — M. E. Hagen, in a report to the Academy of Sciences, gives some facts regarding the physiological and therapeutical effects of oxygen. It is taken in doses of twenty to fifty liters twice a day, mixed with a very small amount of air. It augments the appetite, slightly elevates the temperature, accelerates the circulation, temporarily increases the red corpuscles and the hæmoglobin in the blood, and likewise the weight of the body. It stimulates the nutritive movement of the tissues, and increases thereby the excretion of urea. In *chlorosis* it is a useful adjunct to iron. It acts much in the same way that hydrotherapy does. In *vomiting* it is especially valuable. After one or two inhalations, vomiting will generally stop permanently, if it be not due to organic disease. Vomiting is relieved by oxygen when due to painful dyspepsia, dyspepsia with dilatation, and uræmia.

Treatment of Infantile Diarrhœa. — Dr. L. A. Davidson, in the *Philadelphia Reporter*, says:

I offer the following as a remedy in diarrhœal disorders of children, when the child has passed dentition, and diarrhœa has been protracted some time, through summer heat: —

Syrupi sacchari albi	℥i.
Pulv. rhei	ʒi.
Sodii bicarb.	ʒiss.
Pulv. calumbæ,	
Pulv. pepsin. Americanæ	āā ʒij.
Tinct. capsici	gtt. xxi.

One teaspoonful every other time the bowels move, in *new, cold, alkaline milk* (such as can be had in rural districts).

MISCELLANEA.

Lead-Poisoning from the Use of Cosmetics. — At the recent meeting of the Kentucky State Medical Society, Dr. Holland called attention to the fact that there are certain distinctive, though rather vague, symptoms of lead-poisoning which precede the more marked symptoms of wrist-drop, colic, and lead-line, and which, when more carefully studied, would suffice to lead to an earlier diagnosis. These symptoms he described as headache, vertigo, slight colicky pains, and constipation.

He then gave notes of the case of a woman who, two years ago, began the use of flake-white powder as a cosmetic. After exhibiting the symptoms already mentioned, she had an attack of melancholia of a month's duration; afterwards, the signs of plumbism — double wrist-drop and the blue line on the gums — were abruptly presented. He related in detail several similar cases illustrating the essential points deduced from the paper: that lead may be introduced into the system to the extent of its toxic effects when applied on the skin in the form of powder and lotions; and that the most popular beautifying cosmetics contain lead. The results of the chemical analysis of various popular cosmetics were given in detail.

ALOPECIA FROM NERVOUS SHOCK. — Dr. Thomas H. Kinney, in the *Virginia Medical Monthly*, gives the case of a man of thirty-five who was driving along the road in his cart one day last summer, when the lightning struck a tree very near him. His mule was knocked down, and he himself was rendered insensible. He thought he was unconscious twenty or thirty minutes. With the exception of a dazed feeling about the head, which lasted for twenty-four hours, his health was apparently unaffected. Six or eight days after the shock, the hair on the scalp, face, axillæ, etc., began to come out, and in a few days he was as hairless and smooth-skinned as an onion. The after-history of the case is not given.

DESTRUCTION OF TRICHINÆ. — Recent investigations of Dr. Vacher, of Paris, go to show that boiling does not necessarily render trichinosed meat innocuous. He took a leg of pork of moderate size and boiled it thoroughly. A thermometer placed within it at a depth of two inches and a half registered, after half an hour's boiling, 86° F., after boiling for an hour 118°, after an hour and a half 149°, and after two hours and a half, when the joint was thoroughly cooked, 165°. This temperature, M. Vacher maintains, is insufficient to kill the encapsuled trichinæ.

USE OF ELECTRICITY IN SURGICAL OPERATIONS. — Dr. George Buchanan, professor of chemical surgery in the University of Glasgow, describes in the *British Medical Journal* the application of Faure's secondary or storage battery to the removal of a nævoid tumor from the tongue. He speaks of its surgical application in very high terms, observing that this contrivance, which enables one to carry stores of powerful electricity in a jar no bigger than an ordinary preserving meat-tin, will render the use of electricity in surgery much more extended than heretofore. The growth was very vascular, and invaded the tongue almost to the middle line. The tumor was removed by a platinum wire, heated to incandescence by the use of this electrical jar, without the loss of a drop of blood. Professor Buchanan speaks also at the same time of the surgical use of Swan's electric light, of which Sir William Thomson suggested to him the application at the same time, and which he put to practical use on that day in the wards with excellent effect, employing for the purpose a Swan's electric lamp. Even in a ward of the hospital, where the bright sun could not be effectually shut out, the translucency of the structure which it was desired to see for the purpose of diagnosis was made apparent to the student.

CLINICAL THERMOMETERS. — The use of the thermometer at the bedside is becoming very general, yet to be of any real value the instrument must be extremely delicate and accurate. Unfortunately a good thermometer does not always stay good, and a high price and the name of a well-known maker are not always a guarantee of perfection; hence the necessity of occasionally submitting the instrument to a careful test. The Winchester observatory of Yale College, in charge of Prof. Leonard Waldo, has established a department to which any physician or other person may send thermometers by mail or express, and, upon the payment of a small fee, receive certificates of their exact errors. An old thermometer with a recent certificate is more valuable than a new one. Within three months the observatory has certified about 700 thermometers.

GOUT AND AN ANIMAL DIET. — The theory, which is widely accepted, that high living, and especially rich animal food, is, with insufficient exercise, the great factor in causing gout, has to meet a good many objections. It has lately been found that gout appears in some of the lower animals when fed upon a purely vegetarian diet. This is notably the case with parrots, according to observations of M. Meguin. In a number of these animals he has found well-developed gouty joints.

SELECT FORMULÆ.

NEW SEIDLITZ POWDER. — A correspondent of the *Louisville Medical News* gives the following: —

I prescribe the following seidlitz powder, with better results than the old powder, especially in common colds, where a laxative is indicated: —

Tartrate of soda and potash	℥ ij.
Bicarbonate of soda	ʒ ij.

Dissolve in a half tumbler of water and add,

Powdered tartaric acid	gr. xxv.
Muriate of ammonia	gr. v.

also dissolved in a half tumbler of water. Drink while effervescing.

BORACIC ACID OINTMENT. — A. Krapfenbauer, of London, gives the following formula: —

Boracic acid, in fine powder	6 parts.
Paraffine	9 "
Oil of almonds (sweet)	13 "
Vaseline	8 "

Melt the paraffin, add the oil, and let the mixture become cold. Then incorporate the boracic acid and the vaseline. This ointment has a nice consistence, and will keep for years without separating.

ZOEDONE. — The English chemists have lately been giving a good deal of attention to the making of "temperance" beverages, among which *zoedone* is one of the most popular. This is an effervescing phosphorated ferruginous water, which was invented and patented some three years ago by David Johnson, F. C. S. It is described as a most pleasant and refreshing drink, in which the peculiar iron taste is said to be very successfully masked by a peculiar flavoring syrup, which alone is kept a secret. The quantities of the active ingredients in each small champagne bottle are given by the patentee as follows.

Calcii phosphas	grs. 2½
Ferri phosphas	gr. 1
Potassii phosphas	gr. ½
Sodii phosphas	gr. 1/12

This may serve as a hint for our Yankee inventors.

BORAX TROCHES. — A French authority recommends these in aphthæ, inflammation of the gums, scurvy, and other affections of the mouth. They are best prepared as follows: —

Borax	100 grams	= ʒ 3
Powdered sugar	900 "	= ℥ 3 28
Tragacanth, whole	2.50 "	= grs. 36
Tincture of benzoin	10 "	= fl. ʒ 2½
Carmine (No. 40)	0.15 "	= grs. 2½
Distilled water	60 "	= fl. ʒ 2

Make a mucilage with the tragacanth, one half of the water, and one half of the tincture of benzoin. Incorporate the carmine with the sugar, and mix the borax with one half of the sugar by means of a sieve. Pour out the mucilage, add to it gradually the other half of the sugar, the remainder of the water and of the tincture of benzoin. Finally, incorporate the mixture of sugar and borax, and divide into troches weighing 1 gram (15 grains). Each troche contains about 0.10 gram (1½ grains of borax).

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CHEMICAL ANALYSIS. — As will be seen by a card elsewhere, we have secured the services of a competent chemist to attend to any analytical work that our friends may entrust to our charge. Professor Hallock is a graduate of Columbia College, New York, and of Heidelberg University, Germany, and is thoroughly fitted for the work.

WE would call the attention of advertisers to the superior facilities afforded by the JOURNAL for bringing their goods before a large circle of intelligent readers. Mr. Henry W. Lincoln, a well-known pharmacist of Boston, who has recently undertaken the management of this branch of our business, will be glad to furnish estimates for space, etc., and will take pleasure in calling on those who have no time to call on him. We bespeak for him a kindly reception.

HORSFORD'S ACID PHOSPHATE IN NERVOUS IRRITABILITY AND NERVOUS EXHAUSTION.

DANVILLE, ILL., *January* 29, 1880.

I gave Horsford's Acid Phosphate to a case of Phthisis, in which there was great nervous irritability, with the result of quiet rest and much greater comfort, but no permanent benefit of course.

I have frequently prescribed it in cases of functional nervous irritation and exhaustion, and always with great benefit. It is very palatable, gently stimulating, and, without doubt, supplies more or less force in the weakened state resulting from many of the neuroses. Wherever phosphorus is indicated, I think it will often be found an excellent form for administering that invaluable remedy. GEO. WHEELER JONES, M. D.

AMONG the many new ideas which are presented to and adopted by the medical profession, none have received more favorable notice than the "Petite" Dose Phials of Chloral Hydrate put up by Messrs. Billings, Clapp & Co. They form a unique as well as a convenient package of 12 phials, each containing 20 grains of absolutely pure chloral, glass-stoppered, and securely sealed against decomposition. The fac-simile of package and advertisement will be found in this number.

YOU can keep your premises sweet and clean by using the most efficacious and cheapest disinfectant ever discovered for destroying all sources of impurity and infecticus or contagious emanations. All this we bespeak for Carbolate of Lime, manufactured by Billings, Clapp & Co. For disinfecting cesspools, stables, water closets, hospitals, etc., it is indispensable. See advertisement on page 8.

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STEEL PENS. — The details in making steel pens are inexplicable to the uninitiated. During the process of manufacture, which takes from three to four weeks, each pen is cut, pierced, slit, stamped, scoured and polished, ground twice, and subjected to the action of heat three times. In the final examination the tests are severe enough to satisfy the most critical, the least imperfection in a pen causing its rejection. Thus is secured the luxury of a perfect pen. The leading numbers of business pens made by the Esterbrook Steel Pen Co. are their 048, 14, 130, 333, and 161. Their reasonableness in price and established reputation for quality specially commend them to the consideration of the writing public.

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AND
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Familiar Science.

OBSERVATIONS ON FOODS.

BY DR. C. E. PAGE.

IN discussing this subject the seeker after the truth and the whole truth must not only consider which variety of food, animal or vegetable, is most easily digested and most readily absorbed into the circulation, according to experiments such as have been made, but he may justly question whether experiments as usually made afford a fair test, and whether flesh, however easily digested and assimilated, furnishes blood of as good *quality* as do the grain and fruit foods, or even the ordinary vegetarian diet. The June JOURNAL OF CHEMISTRY contains an article, "Instinct as a Guide in Dietetics," which cites, among others, an experiment made by Professor Hofmann tending to prove that a much less proportion of vegetable, than of animal, food is absorbed.

In view of various experiments of my own, and of several others with whom I am in correspondence, I am forced to believe that the quantity of vegetable food administered by Professor Hofmann to his servant was largely in excess of the needs of his organism, and that this fact fully accounts for the undigested residue. When a healthy body is supplied with *pure food* it is singularly well adapted to the duty of using what it needs, and for a time of excreting the balance without its first being absorbed into the circulation; it passes off by means of the bowels, comparatively little changed: while in case of various pernicious substances, among which I have been led to class flesh food, absorption is rapid and complete, and the circulation may readily be overloaded. Flesh food is not only easily digested, but where an excess is taken beyond the power of the circulation to furnish sufficient gastric juice to dissolve and preserve it, such excess quite speedily ferments, and is absorbed in a state which augments the *amount* of blood, so to speak, but lowers its *quality*. Indeed, if my assumed position is correct, such excess of animal food constitutes *blood poison*. In an article in the January, 1881, *Popular Science Monthly*, "Indigestion a Cause of Nervous Depression," T. L. Brunton, M. D., F. R. S., attributes the feeling of heaviness, weakness, lethargy, so frequently experienced by meat eaters after dinner, to peptic poison resulting from the meat eaten, rather than to the excessive amount of food taken as a whole. This view seems to be corroborated by the fact that *vegetarians* are never, so far as I am aware, afflicted with the disease in question, although many vegetarians are "full feeders," and while usually confining themselves to two, and some to one meal, they never lack for a perfect *appetite* for their food, albeit they are never "hungry;" that is, never have what is known as the "gnawing stomach," so common to meat and pastry eaters, and which is almost universally misinterpreted as a demand for food. Dr. Oswald in the *Popular Science Monthly*, "Physical Education," calls this so-styled appetite *poison hunger*. Whatever else it may be, or whatever is the cause of this condition, the immediate disease is irritation or inflammation of the stomach. In the Hofmann experiment referred to, nothing is said about the age, size, or labor of the servant, and it cannot be rationally claimed that anything more was proven than that when that particular individual ate *twelve hundred and forty-seven grams* of vegetable food a large portion failed of being digested. To be of any real value the test should be made with various amounts, the man to perform the same labor from week to week, say, one week on a given amount, the second week on a much smaller ration (if it should prove that any considerable portion of his food was not digested), and so on, until an allowance was reached where all would be digested, the man's physical condition to be noted in the mean time all the way along. If it should transpire that on one half the first allowance the man gained in muscular power, and that no considerable portion failed of being digested, and that the same man could not thrive while doing the same work on a mixed diet in which bolted flour formed a considerable portion of the food, it would tally with my own experience. The JOURNAL OF CHEMISTRY would be the last among scientific papers to advocate the cause of instinct in its claim of superiority over science, and the first, I fancy, to admit that it may be found at last, when the proof is all in, that the "instinct that leads the working-man to stick to the bread which the experience of many generations has taught him to prefer" is of the same nature as that which impels him to stick to his pipe and beer: he "likes" these things, they minister to a depraved taste, and whether certain habits shall be considered or proven by scientists and health reformers to be right or wrong, he will still stick to them until in the good time coming he shall have evolved out of them. I have never heard the accuracy of Magendie's experiments questioned, and it seems to me that nothing could be more conclusive as to the relative merits of bolted flour and wheat meal. On the former, it will be remembered, the dogs died within forty days, while those fed on wheat-meal bread throve perfectly. Lest it should be demanded, "Is thy servant a dog?" I will offer a few facts with regard to the sufficiency of wheat-meal bread, or pure Graham, to sustain either the brain or muscle-working man. S. N. S. is now twenty-eight years old. Two years ago, although then considering himself in good health, never having been seriously ill, and always able to work, he became satisfied that he was not as strong as a man of his age and height ought to be. He had no bad habits, used no tea, coffee, tobacco, or liquor, but otherwise lived on the mixed diet common to New Englanders. He ate three meals a day, was six feet two inches in height, and could not get above one hundred and thirty-seven pounds in weight. He became acquainted with a gentleman who had for some years been living on one meal a day of vegetable food, and who assured him that if he would adopt the same regimen he would improve in weight, strength, and general health, and that in a year's time he would admit that, notwithstanding he now called himself a healthy man, he was in reality far from it. Mr. S. was so situated that he could not comfortably carry out a system so peculiar: his family ridiculed the idea, and he gave it up, although convinced that it was right. He did, however, leave off his suppers, taking two meals only, and of the usual variety of food (with, however, but little meat), instead of the vegetarian diet recommended. He found himself somewhat improved: at the end of a full year he had gained eight pounds in weight, and was stronger. He now resolved to adopt the one-meal system, and did so, leaving off meat and all condiments, as salt and pepper, and eating chiefly wheat-meal bread and fruit, the bread made from unsifted meal and mixed with water only, no salt or bread-raising devices, — unleavened bread. Within seven months his weight increased from one hundred and forty-five pounds to one hundred and seventy pounds, and his strength of both body and mind had increased in proportion. His labor had been severe; he is a machinist and an inventor, working ten hours every day, and doing a good deal of practical and profitable thinking at the same time. It is now a full year since he came to one meal, and

the weight gained has been maintained, and his health is perfect. During the last winter, for the purpose of testing the sufficiency of one meal of pure food for the most trying labor, he worked in an iron foundry for three months, and notwithstanding the extreme and frequent changes of temperature incident to the work, on cold mornings with the mercury below zero, and in the afternoon at 120° above, and all hands sweating like rain, he had not a "cold" for the winter, and was the only employee thus exempt. He had formerly been subject to frequent "attacks" of the above disease. His daily ration consists of six ounces to nine ounces (according to labor) of Graham flour, besides fruit sufficient to supply all the liquids necessary, — half a dozen apples, or their equivalent in other fruit. He is rarely thirsty, but sometimes, if too little fruit is taken at meal time, he takes a small draught of water in the course of the day. This meal is taken at night, after entire recovery from fatigue, usually at about seven o'clock. During the month of May, 1881, just passed, he gained sixty hours, or six full days, working extra hours at his bench, sometimes working right through to midnight, and taking his "breakfast," after a short rest, before retiring. No man in his employ has gained so much time. He has occasionally made a trial of bolted-flour bread, but has invariably experienced a loss of weight and strength.

My own experience goes far to prove the efficiency of the above regimen for either the brain or muscle worker. I am now taking but one meal a day, and find myself perfectly nourished, weight and strength maintained, on about fourteen ounces of unleavened wheat-meal bread, to the mastication of which I devote an hour or more. I find that six cold gems, weighing about fourteen ounces, without either butter or milk, chewed deliberately and thoroughly dissolved by the juices of the mouth, will sustain me much better than when eaten warm, with butter or milk, or both together, added, and eaten as fast as one naturally eats hot rolls and butter or bread and milk. Considering the manner in which people in general bolt their food, it is not strange that a large proportion of it fails of digestion. Starchy foods cannot be transformed into pure blood entire, except as far as the change is begun in the mouth.

Until a few months ago I took my food in the morning, but I find the evening a better time. During the day the brain and muscles can have everything their own way, without interfering or hindering digestion, and at evening, after a sufficient rest, there is perfect tranquillity of body and mind, and "leisure to digest." I had never been a "good sleeper" until I adopted this system of diet. People who eat several meals a day do well to take the last one early, and the lighter they make it the better, but dyspeptics may rest assured that, *of itself considered*, the evening meal is not the cause of their wakefulness or troubled dreams. When I ate three meals of a mixed diet, I could not make the last one simple enough to give me complete rest at night, but now, when rested from my day's labor, I can eat my full vegetarian meal and sleep like a well-fed babe. I could give quite a number of examples like the foregoing, of one-mealers, did space permit, all tending to prove the superiority of vegetable over animal diet, and of the entire wheat over the most scientifically impoverished article. I will here relate the experience of our young cat, who since she was weaned has lived chiefly on wheat-meal bread. For some months she has subsisted happily on raw meal, mixed with a little milk, twice a day. She much prefers either this or the bread to meat, and although we have never tried to starve her to it, she utterly refuses to eat *bolted flour bread*, even when spread with gilt-edged butter. It may be interesting to some, and to me it seems a very significant fact, the changed nature of this born mouser, who, reared on a chiefly vegetable diet, not only refuses to eat a dead mouse, but actually adopted a live one, presented to her by a male friend anxious to win her favor. She watched over this novel *protégé* for an entire afternoon with the solicitude of a mother or an elder sister. He would lunch occasionally on the "Wandering Jew" (ivy) trailing on the floor, much to Topsy's delight, and showed the utmost unconcern in the presence of his natural enemy, by washing himself, scratching his ear, etc. Two or three times when the cat put a paw out to play with him, the little fellow fastened his teeth in it, and Topsy would shake him off, with no more appearance of resentment than the fondest mother would exhibit at the pat of her baby's dimpled hand. I have not yet forgiven myself for obeying the command of my more blood-thirsty half, who could not consent to the idea of letting the mouse retain the freedom of the house for science's and Topsy's sake, but insisted that life in chairs, and on the tops of tables and bureaus, would be intolerable for her, and that either she or the mouse must die. After mature reflection I decided in her favor, and so killed the mouse.

Regarding the value of the hull of the wheat: if improved machinery could remove it without other loss than that of the "woody fibre" alone, it is held that even this has a purpose in the economy, "analogous perhaps to that of certain azotic gases contained in the air we breathe, which must be separated from the life-sustaining principle by the action of our respiratory organs, not by any inorganic process. We cannot breathe pure oxygen. For analogous reasons, bran flour makes better bread than bolted flour. . . . In the case of bran flour and certain fruits, with a large percentage of wholly innutritious matter, chemistry fails to account for this fact, but biology suggests the mediate cause: the normal type of our physical constitution dates from a period when the digestive organs of our (frugiferous) ancestors adapted themselves to such food, a period compared with whose duration the age of grist mills and made dishes is but yesterday."[1] Most reforms have their ebb and flow, even though real and destined to become permanent. This of the whole meal and anti-animal diet I conceive to be of this class.

LIGHTING GAS BY ELECTRICITY.

THERE are two unlike methods of electrically igniting a jet of gas; the one by an electric spark, the other by means of an incandescent wire. For lighting large halls and theatres the spark furnishes the most convenient method; the gas is all turned on and then a succession of sparks are made to pass over each burner. If some jets fail to light, the spark may be repeated until all are in a blaze.

For lighting the street lamps of a city this method is not well suited. In the first place wires conveying electricity of high tension are more difficult to insulate, and there is more danger. Then too the gas must be turned on and off at each burner, and this ought to be done by the same current that lights the gas. The Thermo and Electric Gas Lighting Company of this city are at present lighting some six miles of street lamps in Salem, Mass., and a description of their method will, we think, be of interest to some of our readers.

The apparatus employed consists essentially of two parts, one for turning the gas on or off, the other for igniting it. The latter is simply a bit of platinum wire, about one inch long, bent into a loop and placed near enough to the slit in the burner to ignite the escaping gas, but is not within the flame itself. When a current is passed over the circuit of such intensity as to heat the loop red-hot, the gas is ignited.

The apparatus that is employed for opening and closing the valve is very simple and ingenious. A rod of steel and a bar of brass are brazed together and bent into a circle with long, projecting arms. One end is firmly attached to one side of the burner, the circle is supported just above the flame, and the other end is attached to a bar that opens and closes the valve. The arch is so adjusted that when cold it presses upon the bar and endeavors to open the valve; this it is restrained from doing by a stud on top of an armature of an electro-magnet. When the current is sent over the wires this armature is drawn down, the stud released, and the valve opened.

When the gas is burning the arch becomes heated, the metals expand unequally, and the movable end of the bar now presses against the valve so as to close it. This it is prevented from doing by the stud on the armature. When it is desired to close the valve it is only necessary to pass the electric current around the magnet, when the armature descends and permits the spring to close the valve.

The electric current may be generated by a battery, but much better by a magneto-electric machine. The cost of running the latter cannot be large, because it lasts only for fifteen minutes, twice in twenty-four hours. The wires, which are insulated and placed underground, can be used during the day for fire alarm or telephones.

AIDS TO HEARING.

THE invention of the telephone and phonograph seems to have given a fresh impulse to inventors to try to devise some kind of instrument to enable the deaf to hear. Among those now before the public we may mention three: the *dentaphone*, the *audiphone*, and one with the barbarous name of *ear-phone*. The two first mentioned are intended for use with the teeth; the third is a modified ear-trumpet. Dr. Charles S. Turnbull, of the Jefferson Medical College Hospital, has recently printed a paper on the audiphone and dentaphone, in which he describes the kind of cases in which these instruments are likely to be of service.

[1] Felix Oswald, M. D., in *Popular Science Monthly*, January, 1881, "Physical Education."

The audiphone, invented by R. S. Rhodes, consists of a diaphragm of hard rubber, about a foot square, provided with a handle, and resembles a Japanese fan. In use it is pressed against the upper teeth; the eye-teeth generally give the best results. The sound waves, caught by the disk, are imparted to the teeth, and transmitted through them to the cranial bones and auditory nerves. Unless the auditory nerve is in good condition, of course the audiphone is useless.

Those who are absolutely deaf, from nervous or inner-ear deafness, says Dr. Turnbull, will not be benefited by it. This form of deafness may result from malignant scarlet and typhoid fevers, meningitis, heredity, and old age.

Those who are profoundly deaf from acoustic or middle-ear deafness are usually relieved by the use of the audiphone. This deafness is caused through direct implication of the middle ear, from catarrhal and other inflammations.

"Those who are partially deaf, from whatever cause, as a rule derive no benefit from the application of the audiphone; on the contrary, many such cases are annoyed by hyperacusis," etc.

The number of cases where "the deaf are made to hear" with the audiphone is small, as compared with the whole of our deaf population.

Absolutely deaf mutes are not benefited by the audiphone, but to the semi-deaf mute it will open a new world of enjoyment, and prove useful in asylums where children are educated according to Bell's method of visible speech.

Although there have been many very successful cases of the application of the audiphone, as a rule, Dr. Turnbull thinks, it has been overestimated. The inventor, however, is entitled to great praise for his novel invention and its novel application.

The dentaphone is totally unlike the audiphone in construction, but identical in principle. It consists of a box, like a telephonic mouthpiece, with an easily vibrating diaphragm. This is connected with a wooden tooth-piece by a silken cord of variable length. It answers fully as well as the audiphone, and can be used for precisely the same class of persons. A fan made of bristol-board, and bent into a curve by pressing it against the teeth, answers nearly as well as the more expensive audiphone or dentaphone.

In regard to the ear-phone, we believe it is capable of relieving many cases where the two first named fail, especially in deafness caused by old age.

ELECTRIC SPARKS.

New Electrical Devices in Fire-Engine Houses. — A Western paper says that the engine-house of No. 9, Cincinnati, is fitted up so as to show in a most remarkable manner the uses of electricity. In the sleeping-room the beds, instead of being ranged against the wall, are placed in the same relation to each other as the spokes of a wheel. Running through the centre of each collection of coverlets, and attached to the under one, is a brass fastening, and from this leads a stout white cord, that, with the others joining in a common centre, forms a rope that passes up through the ceiling, where the other end, riding over a grooved wheel, is made fast to an eighty-pound weight. At the initial movement of the "little joker," that begins its round while the alarm is being sent in from the box to the tower, a catch releases the weight, and the same instant the bed-clothing is dangling in a united bunch half-way to the ceiling. The time used, therefore, by the men in disengaging themselves from the coverlets is saved, and the amount, while small in itself, when added to the other second-saving devices, becomes an important factor. The service rendered by the "little joker" seems almost incredible. Operated by electricity, it performs the following wonderful feats, all of which are done simultaneously: Registering the number of the box from which the alarm is coming, and before it is sounded on the bells; it swings a bracket under the engine-boiler, and, turning on the gas, sends a half-inch-in-diameter jet a foot high through the well-seasoned kindling; the stable doors are thrown open, and at the same time a revolving wooden bar at the rear of each stall, and to which are affixed rawhides, turns rapidly, giving the horses an incentive to vacate as quickly as possible. Meanwhile, the trap-doors, thrown back by the same means, make clear the descent on slippery poles to the firemen, from whom the coverlets have been snatched. Similar electrical contrivances are in use in the Cambridge engine-houses in this State.

Cooking by Electricity. — Of the many curious things certain to be seen at the forthcoming exhibition of electricity at Paris, not the least remarkable will be the electrical cooking range of M. Salignac. That ingenious gentleman is going to fit up his apparatus in the grill-room of the restaurant, and intends to furnish a great variety of meats which have been cooked by heat generated from the electric current. At the last Paris Exhibition, M. Mouchot roasted mutton in condensed sunshine, and literally turned his spit on the hearth of the sun; but an enthusiastic admirer might say that M. Salignac had far surpassed this in broiling steaks by lightning and warming coffee with the aurora borealis. As a matter of fact, the electric current is as well fitted to produce heat as it is to produce light, and just as electricity will, in all probability, be made to yield the principal artificial light of the future, so will it doubtless be applied to household heating. The same machines which light the house by night will heat and cook by day, besides performing other duties, such as driving a coffee-mill or sewing-machine.

Iridium instead of Carbon for Electric Lamps. — A promising improvement has been made in electric lighting by substituting electrodes of iridium for the carbon pencils hitherto almost exclusively used as poles in exhibiting the voltaic arc. Iridium is fusible only in the arc from a very powerful battery, and by keeping the intensity of the current below a given point the metal can be maintained at a temperature of about 4000° F., which is far below its melting-point, though high enough to add the light of an intense incandescence to the brilliancy of the arc itself. At this temperature the iridium points remain completely unchanged, and the variations and flickerings due to the rapid wearing away of carbon pencils are entirely absent in the new light; while the constancy with which the source of the illumination keeps its place peculiarly adapts it for use in the focus of Fresnel lenses, or the parabolic reflectors which in light-houses or in similar situations take their place. The process by which the iridium, naturally a gritty and intractable powder, is formed into pencils for use in lamps is an ingenious adaptation of a patent issued long ago for making the same metal into points for gold pens, and depends upon the property which iridium possesses of forming a compound with phosphorus, which can then be melted at a temperature of about 3000° F., — about the fusing-point of iron, — and moulded into masses which can be subsequently dephosphorized, and regain the original infusibility of the pure metal.

Faure's Secondary Battery. — According to a French journal, the construction of this new apparatus for storing electricity is as follows: Two sheets of lead are taken, 7.87 inches wide; one of these plates is 23.62 inches long, and 40 inches thick. Each plate is covered on both faces with a layer of red lead, reduced to a paste by water, 1.76 lbs. being spread over the larger plate, and 1.54 lbs. over the smaller. On each face a sheet of parchment paper is placed, and the whole introduced into a sheath of thin leather. The plates are then placed one upon the other, with pieces of rubber between them, and rolled up, after which the whole is immersed in a lead cell, coated on the inside with red lead, and filled with a 10 per cent. solution of sulphuric acid. When charged, the apparatus weighs about 20 lbs.

NATURAL HISTORY NOTES.

Food for Wild Beasts. — At the Jardin des Plantes, in Paris, the following are the allowances for the various animals: The monkeys are fed on carrots, cooked potatoes, salad, and bread made from maize and potatoes. The lions, tigers, and bears have each 5 kilos. (including bones) of fresh meat per day. For the panther 3 to 4 kilos., and for the hyena 2 to 3 kilos. of the same suffice. The wild cat gets ½ kilo. of fresh meat without bones. The falcon gets the same. The eagle is served with 1 kilo. and the vulture with 1½ kilos. of fresh meat with bones per day. The elephant eats per day 4 bundles of sainfoin, 1 decaliter of bran, 2 kilos. of bread, 3 or 4 bundles of oat straw: cost 6 f. The giraffe is supplied with 1 bundle of lucern, 2 lbs. of bread, 1 liter of barley, 1 liter of beans, 2 liters of maize: cost 2½ f. to 3 f. The stag, on a half bundle of lucern and 5 liters of bran, is kept for about 1 f. per day. Parrots and such like birds are fed for 25 to 30 centimes per day. It will be borne in mind that the kilo. is 2½ pounds, the liter a quart, the franc 20 cents, and the centime ⅕ of a cent.

Pugilistic Toads. — A correspondent of the London *Garden* says: "I always keep a number of toads in my orchid houses, for the purpose of destroying vermin. The other morning, while watching two males, I was highly amused to see them have a regular set-to fight. They went at each other in a thoroughly scientific manner, sparring and boxing each other with their fore-paws, and butting with their heads. After a while they seemed to get tired, coolly sat down, and viewed each other with great complacency. From my earliest days I have been in the habit of watching the ways of the toad, and, never having seen them fight before, would like to know if any of your readers ever witnessed such a scene."

A Fossil Rhinoceros in the Flesh. — Siberia, which has so often furnished us with fossil elephants, now adds to the list a new form of rhinoceros. It was found on the bank of a small stream in the Werohojanski district, and was laid bare by the action of the water. It was remarkably well preserved, the skin being unbroken and covered with long hair. Unfortunately, no efforts were made to preserve it, and, with the exception of the skull, which has reached St. Petersburg, and a foot, said to be at Irkutsk, it was all washed away by the river soon after it had been discovered. A study of the skull shows that it is a connecting link between the present form of rhinoceros and the extinct species, remains of which are found in the valley of the Thames, at Ilford, and in Prussia.

"Gelatinous and Delicate." — Dr. Leidy, in an article on trichinæ in the Philadelphia *Ledger*, says: "Appropriate to the subject an anecdote may be here related. Some years ago, in Charleston, S. C., at an entertainment, among other dishes served was one of the tail of the drum-fish, in nice brown slices. The writer was helped to a piece said to be

particularly gelatinous and delicate. These qualities seemed to depend on a jelly-like substance imbedded in the flesh. Curious to know its meaning, the next day a drum-fish was procured in the market, and on dissection of the tail it was found to be due to a huge parasitic worm (*Acanthorhynchus*) coiled into a mass nearly as large as a hen's egg."

HOME HINTS.

To Preserve Flowers. — Dissolve by agitation and digestion in a closely stoppered bottle ¾ oz. clear, pale gum copal, coarsely powdered and mixed with equal weight of broken glass, in 1 pint of pure sulphuric ether (ethylic ether). Dip the flowers in this liquid, remove quickly, expose to the air 10 minutes; then dip again, and expose as before. Repeat this dipping and drying four or five times. Most flowers thus treated will remain unaltered for some time if not handled.

Salmon Croquettes. — These are a good breakfast dish, and are not at all difficult to prepare. Canned salmon may be used when it is impossible to get the fresh fish. Mix the salmon with fine bread or cracker crumbs, roll in flour, and fry in butter, or use part butter and part lard. If when using lobster for salad you have some left, it may be mixed with bread crumbs and fried in butter. This is an inviting breakfast dish.

Practical Chemistry and the Arts.

DETECTION AND ESTIMATION OF GLUCOSE.

In a previous article we gave a general description of the manufacture and properties of glucose, without entering upon a full description of the optical properties of all the different kinds of sugars.

There are many organic substances occurring in nature to which the name of "optically active" is applied. Such bodies, when in solution, possess the property of twisting a ray of polarized light either to the right (dextro-rotatory) or to the left (lævo-rotatory). The vegetable acids, such as tartaric and malic, the vegetable alkalies, quinine and cinchonine, and nearly all kinds of sugar, exert some influence upon polarized light. The sugars which turn the ray to the right are called dextroses, those which turn it to the left lævuloses.

Cane sugar possesses the property of twisting the polarized ray to the right, and as the amount of angular deviation depends upon the quantity of sugar in the solution, a method based upon it is extensively employed for estimating the value of sugars and syrups.

Grape sugar and glucose made by the action of dilute acids upon starch, dextrine, or cellulose will turn the plane of polarization to the right, and are therefore very properly called dextro-glucose.

Honey contains two kinds of sugar, each having the same chemical composition and the same power of reducing alkaline copper solutions, and both are directly fermentescible. One of these seems to be identical with the dextro-glucose made from starch, while the other possesses the property of turning the plane of polarization to the left, and hence is called lævo-glucose.

When cane sugar is boiled for a long time, or submitted to the action of acids, it is converted into a mixture of these two kinds of glucose, known as *inverted* sugar, because unless heated above 88° C. it now turns the polarized ray to the left instead of to the right, the deviation depending on temperature as well as on the amount of sugar. Inverted sugar reduces the alkaline copper solution in the same manner and to the same extent as glucose or dextrose.

In the manufacture of cane sugar from the juice of the cane or from maple sap, more or less inverted sugar is liable to be formed, and, after the cane sugar has crystallized out, remains in solution in the syrup. Hence it is that genuine syrups made from the cane or maple often possess the power of reducing the copper solution in a remarkable degree, and are supposed by some to be adulterated with glucose. Unfortunately there is no purely *chemical* test whereby inverted sugar can be distinguished from glucose or starch sugar. In such cases one must rely upon the polarimeter. Before proceeding to describe how this is done we must say a few words about dextrine and maltose.

When starch is acted upon by acids, it is first converted into soluble starch (according to Musculus), next into dextrine, then into maltose, and finally into glucose. Dextrine possesses a strong dextro-rotatory power, is rather sweetish, but will not reduce the alkaline copper solution. Maltose is very sweet, possesses about three times the rotatory power of glucose, but (as stated by O'Sullivan) reduces only two thirds as much copper as the same weight of glucose. From this it is easy to understand why the polarimeter and Fehling's test will not agree when applied to mixtures of the three, as they frequently occur in commercial glucose. At the Boston meeting of the American Association for the Advancement of Science, in 1880, Prof. H. W. Wiley first pointed out the fact that "the rotatory power of commercial glucose increases as the percentage of reducing substances decreases." Hence in the manufacture of glucose from starch the point of maximum sweetness and maximum rotatory power is reached as soon as the starch is all converted. At this time the reducing power is small, but as the conversion proceeds, the rotatory power decreases and the reducing power increases until all the dextrine and maltose have been converted into glucose.

From the above description we see that the presence of glucose in cane sugar cannot be detected with certainty, nor the quantity estimated, with Fehling's copper solution unless we are certain that other reducing substances, like lævulose and maltose, are absent.

The method usually employed in analyzing a mixture of cane and grape sugar is as follows: Exactly 10 grms. of the sugar are dissolved in water and diluted to make 100 cc. This is placed in an observation tube 200 mm. in length, and the degree of dextro-rotation read in the polarimeter. If the instrument is furnished with a cane sugar scale, the reading must be multiplied by 2.6048, as the weight usually employed is 26.048 grms. in 100 cc. of solution.

The cane sugar present is next to be inverted. This is best accomplished by warming the solution slowly with one tenth its volume of strong hydrochloric acid to a temperature of 68° C. After cooling it is placed in an observation tube 220 mm. in length, and the rotation (which may now be to the left) is read and multiplied as before by 2.6048. The temperature at which the reading is made must be carefully noted. The difference between the two readings (in cane sugar degrees) is to be divided by a factor (established by Clerget) found by subtracting half the temperature, in Centigrade degrees, from 144. The quotient gives the percentage of cane sugar present. After estimating the water in the usual manner by heating to 150° C. and allowing 2% for ash, etc., the residue can be credited to glucose, maltose, etc.

A modification of the optical method has been devised by Drs. Chandler and Rickets, based upon the fact that lævulose, or inverted sugar, loses its rotatory power when heated to 88° C. If a solution of pure cane sugar is inverted in the usual manner and heated to 88° while in the polarimeter, it will have no effect on the ray, whereas the glucose, maltose, and dextrine continue dextro-rotatory. If only one of the three were present it could be estimated from the angle of rotation, but this is not likely to be the case in practice, hence we can only estimate the cane sugar as before and credit the rest to adulterants in general.

When "new process" sugar is spread in a thin layer on a piece of glass and treated with a little water, the cane sugar dissolves first and the grape sugar is left as a flocculent mass. Under the microscope it is recognized by the absence of crystalline structure.

INDUSTRIAL MEMORANDA.

Underground Railways in Paris. — A grand system of underground railways is planned in Paris, and seems likely to be carried out. The central station will be in the garden of the Palais Royal, at a depth of twenty-four feet below the surface, and from that point three main lines will diverge toward the great railway stations and the principal suburban points, while a separate road will follow the south bank of the Seine. Some such means of communication between the different parts of Paris has become very necessary. Foreigners, who have plenty of time for riding comfortably about the streets, can content themselves well enough with the cheap carriages, which will transport them over the long distances at an expense which seems to them small, and with a sufficient degree of swiftness and punctuality for their purposes; but for the careful and economical French neither time nor money is a thing to be wasted, and swift conveyance, at low rates, is one of the things to which the Parisians have long looked forward. The establishment of the elevated railways in New York excited great interest in France, and a similar line was at one time seriously contemplated in Paris, but, as on this side of the ocean, subterranean routes seem best to meet the popular demand.

Compressed Fuel from Coal Dust. — An interesting process for preparing compressed fuel from coal dust has been devised by Mr. L. Trallo. The dust is placed in an iron vessel provided with an archimedean screw and heated by means of steam. As the vapor is driven out of the dust, it is withdrawn from the apparatus by a large air-pump, and at the same time a certain distillation of the volatile portions of the coal takes place, which renders it somewhat cohesive. It is then pressed into bricks of a suitable size by means of a steam ram. The fuel thus prepared is said to give general satisfaction in Germany, where the process is quite extensively used.

Bismuth in Soft Solders. — The fusibility of soft solders is increased by adding bismuth to the composition. An alloy of lead four parts, tin four parts, and bismuth one part is easily melted; but

this alloy may itself be soldered with an alloy of lead two parts, bismuth two parts, and tin one part. By adding mercury a still more fusible solder can be made. Equal parts of lead, bismuth, and mercury, with two parts of tin, will make a composition which melts at 122° F.; or an alloy of tin five parts, lead three parts, and bismuth three parts will melt in boiling water. In mixing these solders, melt the least fusible metal first in an iron ladle, then add the others in accordance with their infusibility. To cast strips of solder, pour the molten metal on a flat surface of stone or metal.

Balloons in Submarine Work. — That the balloon should be of any service in submarine operations might strike one at first as a thoroughly Hibernian idea; but, according to foreign journals, an experiment lately made in the port of Kiel proves that heavy weights may be readily lifted from the bottom of the sea by this novel means. The balloon is made of canvas and metal plates, with an attached cistern containing carbonic acid gas compressed to a liquid state. When made fast to a sunken object, the communication between the cistern and the balloon is opened; inflation takes place; the sunken vessel, or whatever else it may be, is lifted, and can be towed away at pleasure. In the experiment at Kiel, an anchor-stone weighing 15 tons was thus lifted from a depth of 32 ft. The lifting power of a balloon 10 ft. in diameter is said to be more than 100 tons.

An Accidental Discovery. — At a Berlin feather-dyeing establishment an ostrich feather dyed in shades with methyl-violet was laid upon a paper upon which some ammonia had been poured, but had dried up again. After a time the feather became partially green, the green passing gradually into violet, and producing an extraordinary effect. This reaction is being utilized in feather dyeing, and will probably be applied in the manufacture of artificial flowers.

New Method of Making Steel. — A Frenchman has devised, it is said, a method of converting iron into steel, and at the same time producing illuminating gas. The iron is placed in a retort with charcoal or coke in layers, and is heated to 1650 degrees Fahrenheit. Fatty matters are then injected, and as soon as decomposition has taken place a jet of dry steam is passed over the incandescent mass. The iron is thus changed into steel, while carburetted hydrogen is given off from the retort.

Sawdust Car-Wheels. — Car-wheels made of paper have been in use for some time. Now comes a car-wheel made of sawdust, which is an abundant waste product in the saw-mills of the West. The *Lumberman* describes a model wheel, consisting of an iron rim of seven inches outward diameter by half an inch thick, fitted with a well-proportioned hub, the space between being filled with pine sawdust, pressed in so solidly that we are ready to believe the assertion that a pressure of twenty-three tons applied to the hub failed to develop any signs of weakness.

French Gutta Percha. — This is the name applied to a gutta-percha substitute obtained from the outer portion of birch bark by boiling it in water over an open fire, and then evaporating this extract, when a black fluid substance remains, which soon becomes hard and very compact by contact with the air. It is said to have all the best qualities of gutta percha, does not crack like the latter, is stronger and cheaper. It can even be combined with gutta percha, which is improved by this adulteration.

Luminous Paint in Photography. — In the manufacture of photographic transparencies it is customary for those who use dry plates to place the sensitized plate beneath a negative in the printing frame, and then expose it for a few seconds to the light of a lamp or gas jet in the dark room. It has been found that it is more convenient and equally effective to place the prepared plate on a sheet of paper covered with luminous paint, the light from which is very rich in the actinic rays.

LABORATORY NOTES.

Campeachy Wood for Coloring Wine. — Pizzi recommends the following method for detecting Campeachy wood in wines: Shake together twenty centimeters wine and two grams pulverized manganese dioxide, and filter. The filtrate is subjected to the reducing action of zinc and hydrochloric acid, whereby hæmatoxyline is formed and can be recognized by its known reactions.

Phosphomolybdic Acid. — Atterberg shows that if a solution containing phosphoric acid is *boiled* with a solution of molybdic acid in nitric acid, the former acid will be completely precipitated without the necessity of digesting the solution for a long time at 60° C., as has been customary.

To Distinguish Ptomaines from Vegetable Alkaloids. — Ptomaïnes are substances resembling the alkaloids, and found in dead bodies. This great resemblance might lead to serious mistakes in cases of suspected poisoning; hence Brouardel proposes, before testing for alkaloids, to treat the isolated sulphates with potassic ferricyanide. This substance is at once reduced, by ptomaïnes, to the ferrocyanide, and then yields a blue color with ferric chloride. Of all the vegetable alkaloids, morphine alone possesses this property of immediate reduction; veratrine reduces only a trace of it.

Fowler's Solution of Arsenic. — The vegetation that sometimes forms in solutions of arsenic can be avoided, according to Perschne, by replacing one fourth of the water with glycerine.

Salt Wells in Paterson, N. J. — A well was sunk to a depth of 2100 feet in the red sandstone (Triassic) at Paterson, N. J., when the water ascended to within thirty feet of the surface. It was about half as salt as the water of the ocean, and contained 929½ grains of solid matter in a gallon.

Lævulane in Beet-Sugar Molasses. — Lippmann has isolated an amorphous snow-white body, having the composition $C_6H_{10}O_5$, from the molasses of beet-root sugar. When treated with dilute acids it forms lævulose, and by oxidation with nitric acid mucic acid, whereas dextran yields with dilute acids dextrose, and by nitric it is converted into oxalic acid.

Black by Day and White at Night. — Dr. Phipson describes a gate-post that had been painted white, which appeared black all day, but white every night. This was probably due to the phosphorescence of the barium sulphide which it contained. His analysis gave the following composition: —

Barium sulphate	41.50
Barium sulphide	1.02
Protoxide iron	2.12
Oxide zinc	16.30
Sulphide zinc	37.44
Loss by calcining	1.62
	100.00

Codeine from Morphine. — E. Grimaux has found that codeine is simply the methylic ether of morphine, and hence the latter may be converted into the former. A series of new bases, of which codeine is the type, may be made from morphine as a sub-stratum. The author gives them the generic name of codeines.

Artificial Chinoline. — Skraup has succeeded in making artificial chinoline by the action of sulphuric acid and glycerine upon a mixture of nitrobenzole and aniline. As this substance was previously obtained from quinine, perhaps quinine will yet be made from chinoline; hence Skraup has taken the precaution to patent his process.

Malleable Cast Iron. — Graphite is always found, says Forquignon, in malleable castings, and when magnified 400 times still appears perfectly amorphous. Cast iron may lose carbon and still remain brittle. It can also be rendered malleable without losing carbon; two per cent. of manganese prevents the formation of graphite.

Silver in Nitrate of Bismuth. — According to Dr. Landerer the blacking of bismuth salts when exposed to sunlight is due to the presence of chloride of silver, since silver is sometimes present in metallic bismuth.

Peroxide of Ethyl. — Berthelot has found that when oxygen containing a large percentage of ozone is passed through absolute ether, the ozone is slowly absorbed, and a portion of the ether is oxidized to a peroxide, $C_8H_{30}O_3$, which remains behind as a thick, syrupy liquid when the ether is allowed to evaporate. When heated it explodes with violence. It is decomposed by water into alcohol and peroxide of hydrogen. Babo was the first who noticed the production of peroxide of hydrogen from ether and ozone.

Reduction of a Permanganate by Hypochloric Acid. — Fuerst finds that when a solution of potassic permanganate is allowed to drop slowly into a solution of hypochloric acid, the color of the former is rapidly destroyed, and a brown precipitate of manganese dioxide is formed. The hypochloric acid is oxidized to chloric acid, potassic chlorate being one of the products formed.

PRACTICAL RECIPES.

Cleaning Old Engravings. — If brown spots and rings of mildew have not made their appearance, float the engraving face downwards for 24 hours on a large quantity of water in a vessel perfectly free from grease and soil of all kinds. Lift it from the water on a perfectly clean sheet of glass, drain, transfer to blotting-paper without touching it, then transfer to fresh blotting-paper, dry, rub with bread as is done in drawings, and iron.

If the stains are bad, or are not removed by this plan, place the engravings in a shallow dish, and pour water over them till they are completely soaked. Carefully pour off the water, and replace it by solution of chloride of lime (1 part liq. calcis chloratæ to 39 parts water). As a rule the stains disappear as if by magic. If not, pour on the spot pure liq. calcis chloratæ; if that does not succeed, add a little acid nitrohydrochlor. dil. As soon as the stain disappears, wash the engraving carefully with successive portions of water till all the chlorine is removed. Then steep it in a weak solution of glue or gelatine, which may be colored with coffee grounds, to give the engraving a yellow color. Then dry between blotting-paper under a weight, and iron with a sheet of clean paper between the iron and the print. Small grease spots may be removed by putting powdered French chalk over them, a piece of clean blotting-paper over the chalk, and a hot iron over that. If the stains are larger, benzine must be used, applying it in a circle round the stain before touching the stain itself.

To Make Cisterns and Tanks Water-Tight. — Paint thickly on the inside with a mixture of eight parts of melted glue and four of linseed oil, boiled with litharge. In forty-eight hours it will be so hard that the tank can be filled with water.

To Remove Coffee or Milk Stains. — The *Industrie Blätter* recommends the use of glycerine for this purpose. The silk, woolen, or other fabric is painted over with glycerine, then washed with a clean linen rag dipped in lukewarm rain water, until clean. It is afterwards pressed on the wrong side with a moderately warm iron as long as it seems damp. The most delicate colors are unaffected by this treatment.

Agriculture.

THE MUCK DELUSION.

THE delusion which prevailed twenty and more years ago, regarding the manurial value of what is known as *muck*, has lost some of its force, but it still exists among farmers, especially those new in the industry. Among the newspapers "the great value of muck to farmers" is a standing text from which a labored sermon is preached once or twice a year. Twenty-five or thirty years ago, a little book was published by Dr. Dana, a Lowell chemist, employed in one of the dyeing establishments of that city, which supplies the material for these sermons, and will continue to do so perhaps for the next half century. That book is full of errors and absurdities, and has led more farmers into incurring serious expenditures without corresponding returns, than any book on manure ever written. The fallacy of muck consists in the error of regarding it as manure, or a substance which turns spontaneously into manure without cost to the farmer. The term "muck" is usually applied to the dark, wet, unctuous product of low meadows, and the black mud from the bed of marshy lakes and frog ponds. The material varies greatly in physical character and chemical composition, no two specimens taken from different localities being alike. The advocates of muck, or the writers upon the subject, have but little to say in regard to these important modifications; with them, muck is muck, whether it be made up of black sand or of vegetable *débris* in a stage of partial decomposition. Now, muck is not a manure, whether it comes from a peat meadow or from the silicious deposits in the bed of a dried-up frog pond. It is not manure, and moreover it cannot be made into plant food by any expense of time and labor which the farmer can afford to apply to it. For a period of twenty-five years we have given much attention to muck, and have instituted a series of experiments with it in the laboratory and in the field, in all the forms and modifications in which it is found upon New England farms, and we say now, what we have often said before: it is a material which in general farmers cannot afford to spend much time upon. If it had absolute or potential value as manure, the wet mud from meadows cannot be hauled long distances with profit, but it has not under any circumstances manurial value. The peat of bogs, as freshly taken out, averages of water fully ninety per cent., and a load of this of two thousand pounds gives but a couple of hundred pounds of dry humus at the barn. If through inexperience or want of close observation a farmer backs up his cart to a mud hole, dry in summer, he loads into it a substance which is usually valueless; we have seen many farmers hard at work, after haying, upon a deposit of this nature, and have often had the pleasure of saving them much toil, by proving on the spot the worthlessness of the substance they were endeavoring to utilize. A substance holding seventy per cent. of clear sand, and thirty per cent. of black mould, is "one well calculated to deceive." It looks rich, and is tempting to many who desire to increase their manurial resources. A little of this material put into a tumbler and stirred up with much water at once reveals itself, as the sand settles to the bottom and the black vegetable matter floats above.

The true value of muck is well understood among chemists, or at least it ought to be. It really holds no available plant food, although it contains some nitrogen and carbonaceous elements. These do not exist in it in available forms, and cannot be brought into that state at a cost which will under ordinary conditions warrant transportation and manipulation. Muck has a certain value as an absorbent of liquid manure, and it may pay to procure and dry it for such purposes; but to meet this want it must be convenient to the barn, and of good quality. Farmers cannot afford to be deluded or led astray on any point, and therefore it is important that the true value of what is called muck should be understood.

DR. VOELCKER ON BUTTER-MAKING.

DR. VOELCKER, the eminent chemist of the Royal Agricultural Society of England, delivered a series of four lectures on the "Principles of Butter-Making," at the recent annual exhibition of the society at Derby. The views of such a man on such a subject cannot but be of interest to our farmer friends and to all others concerned in dairying, and we therefore condense the following paragraphs from the reports of the lectures in English journals: —

"Cream consists of a certain proportion of water and fatty matters, and a small proportion of casein. If this latter element were absent, the principal difficulties in the way of butter-making would be at once overcome, because it is due to the rapidity with which casein turns sour that butter obtains the rancid taste which we sometimes detect. If by any means we could separate the fatty matter from this casein or curd matter, we should get excellent butter; and it is on this account that I believe dairy farmers will never obtain the first quality butter from whole milk, certainly not the same quality as that which is obtainable from cream. The composition of cream varies greatly, and the same remark applies to the fatty matters of which it is constituted. This circumstance I attribute in a very large degree to the feeding of the cows. Nobody, for instance, can feel any astonishment that when cows are fed upon turnips, swedes and mangels, there is a more or less disagreeable flavor in the butter made from the milk of these cows. In my opinion, the best flavored butter is made from the milk of cows fed, not upon rich pastures, but upon what are generally considered poor pastures; that is to say, those with scanty herbage, such as is to be found upon the hilly land which abounds in this country. By rich pastures I mean pastures which produce a large bulk of grass, but which are not composed of a great variety of herbage. The richer the quality of the cream, the richer will be the quality of the butter made from it.

"It has been said, with a good deal of truth, that by over-manuring pasture land we reduce the fine quality of the butter made from the milk of cows fed upon such pasture. My belief is that the finest quality of butter is produced from pasture which contains a great variety of herbs, some of which might even be ranked as weeds. The question is, Can ordinary pasture produce first quality butter? and I answer, 'Decidedly, if you take proper precautions to prevent the cream turning sour before it is churned.' This sourness, let me repeat, is the great hindrance in making high-class butter. Many persons deem this a small matter, and unconsciously allow the cream to get somewhat sour before making butter; but if you desire to produce good, sweet, keeping butter, you must churn cream as sweet as possible.

"But how are you to prevent cream getting sour? In the first place, you must carefully look after all the people employed in and about the dairy, to see that they always have the importance of cleanliness before their eyes; and above all see that those who milk the cows do so with clean hands. Secondly, you should be sure that the cows are perfectly 'stripped,' because if this is not done it is the means of sowing the germs of rancidity. Then, when the milk is drawn from the cow, it ought to be cooled down directly to about 55°, so as to take the animal heat from it.

"As to the question of shallow or deep pans for 'setting' for cream, I am an advocate for the use of deep ones. After being filled with milk, these pans should be placed in a vessel containing water — ordinary pump water answers well — for twelve hours; or, if the milk is extra warm, a little ice may be used, and this would result in a large proportion of cream rising. In order to prevent rancidity, it is very important that the cream should be churned at once. In small dairies, however, this is impracticable, and in such cases every endeavor should be made to prevent the casein from turning. And here let me say, do not churn too quickly. Do not be in too great a hurry and turn irregularly, because if you do failure will almost certainly result. Turn steadily, at about forty-five or fifty revolutions per minute. As soon as butter comes — and this you can tell by the noise — it is time to stop the churn and deal with the butter kernels. Strain off the buttermilk, put some cold water into the churn, and turn it again two or three times; this will have the effect of washing the butter. Perhaps the best way is to incorporate the smallest quantity of salt, or salt water, into the churn, so as to distribute the salt evenly among the butter. I do not recommend too frequent washing, as this only results in the butter losing that fine natural flavor which it should possess. After each process of butter-making, the churn and other utensils should be cleansed with boiling-hot water. In butter-making everything depends upon scrupulous cleanliness, the use of plenty of hot water, or steam if it is available, followed by cold water.

"One of the first necessities in the making of good butter is to have at command an abundance of cold water, — spring water if possible, or pump water, — so as to get rid of the animal heat as soon as the milk comes from the cow. By this means, also, you get rid of the animal flavor. Whenever you have the means of setting milk for cream, I strongly advise you to do so. If you take care to keep cream as closely as possible to a temperature of 55° to 57° Fahr., you will not only get a larger produce of butter, but also butter of a better flavor. By using deep pans, and in hot weather putting a lump or two of ice in the vessel of water in which the pans are placed to preserve the temperature below 58°, I am ready to guarantee that cream will keep without turning sour for a period of at least eighteen hours. Butter should always be made from perfectly sweet cream.

"In the art of butter-making chemistry is not required. It is a simple mechanical operation. Some people are of opinion that a certain degree of sourness in cream is necessary in order to obtain good butter. My experience has taught me differently, and I denounce the sour-cream theory as radically wrong. There is an opinion that the longer cream continues cold the worse it becomes. Sometimes a novelty, if carefully investigated, proves to be far more useful when thoroughly worked out and practically tested than the experience of the man who has been going on in his own way for twenty years. A great many such men maintain at the present time that the best quality of butter can only be made if cream is allowed to turn a little sour. This is a great mistake. The sweeter the cream, the better the butter will turn out, other circumstances being equal.

"Milk is a mechanical mixture, not a chemical compound. It is well to remember this, because it is not by chemical means that we separate cream from skim milk, but purely by mechanical means. The cream globules rise to the surface, and by proper management the cream is taken away from the skim milk. In this way we obtain the cream perfectly sweet, and provided the food given to the cows is of such a nature as to produce sweet and not 'turnipy' cream, we can obtain excellent butter by churning it properly. Although my profession is that of a chemist, I would impress upon you that the less chemical you use, or the less you attempt to meddle with chemical agencies in the separation of butter from the cream, the better will be the result. If you pour off the buttermilk as soon as the butter comes, you will have butter much more free from the cheesy or curdy envelope which originally encased it in the creamy globule. And you will never make first-rate butter unless you preserve a regular temperature in churning. The temperature should never rise above 60°, it should be rather below than otherwise. I am no advocate of all these beautiful air churns, and complicated contrivances. You do not want them. In a good churn you simply require an implement which enables you to churn sufficiently without overdoing it. All churns should be so constructed as to be easily cleaned. The requisites for successful butter-making are, a well-constructed dairy, not subject to great fluctuations of temperature; a dry floor, perfect cleanliness, appliances for introducing hot or cold water, or steam; and in the last place, washing it moderately, and salting it in the churn. If you want to make first-rate, firm, fresh butter, there is no secret; no great chemical skill is required, only ordinary attention to a few simple principles; and by observing them I warrant that you obtain for your butter a better price."

THE HEALTH OF PIGS.

A CORRESPONDENT of the *Rural New Yorker* gives the following advice with regard to keeping pigs in good health: —

Too little attention is usually given by farmers to the stomachs of pigs. They are expected to eat anything and everything, or perhaps to live a long time on only one kind of food. This want of attention is the cause of frequent diseases among pigs, chief of which are diarrhœa and constipation. Regular feeding of salt in moderate quantity and of sulphur, with an occasional feeding of charcoal (once a week), will serve to make a good appetite, promote digestion, and prevent disturbance of the bowels, which is more likely to occur without these precautions. The health and digestion of pigs would undoubtedly be promoted if they had access to prepared chalk, or if a small amount of magnesia was given them in their food. Pigs suffer much from indigestion, caused by over-eating, and if they had the remedies accessible their instincts would teach them to make use of them and thus prevent the frequent result — diarrhœa.

In summer time, when pigs have access to the ground, they cure themselves, or, in other words, prevent diseases of the stomach by eating grass, which is laxative, or earth, rotten wood or bits of charcoal, which seem to check this condition or to prevent extremes. The best medicine for any animal is preventive, hence the food and surroundings should be such as to promote health. The opposite is too frequently the case, as pigs are often kept in filth, and their food is prepared for them regardless of sanitary laws, their physical wants or natural instincts. This inconsistency is all the more remarkable when we consider that they are always reared only for human food, and are most liable of almost all animals to possess parasites in their bodies, and are susceptible of a great variety of diseases, and among them those of a scrofulous nature, which may be transmitted to the human family when the pork is eaten. I never eat random pork, as I am afraid of it.

When carefully raised and properly fattened, however, pig meat is healthful food. The omnivorous nature of pigs makes them more dangerous food than beef or mutton, as neat cattle or sheep will not naturally eat anything but grain or vegetables, while pigs are kept sometimes on putrid food or the refuse of slaughter-houses. Cattle may be taught to subsist on fish and be made to consume swill, but the number of such animals which are turned into beef in this country is extremely limited, while "swill" hogs are much more plentiful. A butcher or any person who cuts up such animals can readily distinguish them, as the flesh is soft and flabby. It should be made a misdemeanor to sell such meat, as it is not healthful food. Pigs from the country are almost always fattened on grain, and the firmer the flesh the nearer it is to perfection and health.

GLEANINGS.

THE PREMIER ON CORN. — In his budget speech before Parliament, Mr. Gladstone made the following remarks: "I wish to give a little detail about the case of maize, because it is an interesting illustration of the mode in which, where freedom is given to industry, private enterprise discovers methods of making that freedom gainful. Maize was considered somewhat hard for brewing, and it was also found, when the experiment was seriously made, that it contained too much oil, which was a very grave objection. But this further discovery was made, that this excess of oil was not diffused through the general body of the grain, but lay entirely in that which is called the germ; consequently, the wit of man, thus provoked and stimulated, extracted the germ from the grain, and turned it to its proper account, namely, that of making oil, which we can burn in our lamps. The maize, relieved of the excess of oil, and now made suitable for brewing, was applied for that purpose; and I understand that the result is not only satisfactory as regards the beer which proceeds from it, but likewise it is satisfactory in this point, that the residue is found to be even more available and decidedly more profitable for feeding cattle than the residue formerly obtained from barley."

PETROLEUM ON TREES AND BUSHES. — At a recent meeting of the California Academy of Sciences, Dr. H. Gibbons said that since he put petroleum on the trees in his garden they have grown better and faster than ever before, and given better roses than before. The petroleum seems to kill the scale insect. The handsomest rose he exhibited was from a bush which looked nearly dead a short time before. The petroleum was mixed with castor-oil. It is applied sparingly, and great care taken that it does not run down the roots. Perhaps in a crude state the petroleum would be bad, even on the stalks; but mixed with the castor-oil it appears to be advantageous to the plant.

GRAPE CULTURE AND WINE-MAKING IN CALIFORNIA. — The cultivation of grapes and the manufacture of wine are yearly interesting more capital and skill in California. In 1880 the State produced 10,000,000 gallons of wine, 450,000 gallons of brandy, raisins to the value of $100,000, and grapes for table use to the value of $150,000. The total yield from the culture of the grape amounted to $3,500,000. Over 10,000 acres were planted in grape vines also, and it is said that this year 20,000 acres will be added. Besides the land already used for grape culture, there are over 10,000 acres of unsurveyed land in California suitable for this purpose. Over $30,000,000 are now said to be invested in grape lands and wine-making on the Pacific coast.

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JAS. R. NICHOLS, M. D., *Editor.*
WM. J. ROLFE, A. M., *Associate Editor.*

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FOODS.

THE matter of foods, as relates to the best forms and methods of using, so as to supply nutrition to the human organism, is a subject so important, no wonder it provokes continued and extended discussion. It is a field in which empirics flourish as well as men of eminent scientific accomplishments, and the views expressed are diverse, conflicting, and often very absurd. At one time a class of vegetarians provoke public attention by their clamor; at another, men who would banish all forms of vegetable foods hold the field, and mankind are declared to be carnivorous animals, and must be fed, like lions and tigers, only with flesh foods. Experiments have been conducted often and persistently to prove one or the other class of opinions erroneous, and however conflicting may be views of the results, one point has been settled, and that is, that human beings can exist and flourish on either kind of aliment, or on both kinds together, in any proportions that fancy may dictate. This does not, however, place beyond the field of controversy the question as regards the best forms of food for the weak and sickly, those whose organs of digestion and assimilation are impaired in functional activity.

The paper of Dr. Page, found on the first page of the JOURNAL, we have admitted because some rather novel experiments in dietetics are presented, and some suggestions made which may be worth considering. We presume the statements are reliable, and while the experiments do not show that a diet of unleavened wheaten bread is best for everybody, they do show that one can not only live, but thrive, upon the use of a single form of food. Wheat is a wonderful cereal, and in its chemical composition the evidence of *design* is so apparent that one must be stupid indeed, who does not discover it. There is not a function of the body that cannot be sustained upon the principles stored up in the wheat berry; and there is not a nerve or tissue that cannot be nourished and fed by it alone.

As regards the distinction, nutritively considered, between the whole grain and the white flour of the interior parts, there is no room for doubt or dispute. It is the whole grain which constitutes perfect food; the white flour is incapable of affording complete and healthful support under all conditions of human existence. The white loaf is very beautiful and fashionable, but it does not contain the phosphates of magnesia, lime, and soda which are found in the brown loaf. These salts are stored for some wise reason, doubtless, in the bran or outer covering of the grain, and they are certainly lost to a large extent in the bolting process.

Nature is wiser than man, as man is but a creature of nature. A fact so significant as that which is brought to view in the study of the chemistry of the wheat grain must not be treated with contempt. It may be an error, and it probably is, to supply the outer coverings of wheat in the loaf, in coarse particles, but it is not an error to hold them in combination, in every form of

food which may be desired. There is much said and done in regard to this matter which is empirical and unworthy of trust, but the plain facts as stated remain.

ATMOSPHERIC DUST.

THE readers of the JOURNAL are aware that in many parts of the earth there has often been observed a precipitation of dust from the atmosphere, which has been supposed to be partially of cosmic origin. Examination with the microscope has shown that portions of it are organic — animal or vegetable; and this is doubtless terrestrial in its birth. We can easily understand how these infinitesimal organisms may be carried up by air currents, to fall afterwards in showers of fine dust, perhaps at a considerable distance from their source. The "red snow" of the Arctic regions, for instance, is of this organic and earth-born character.

But the greater part of this atmospheric dust is inorganic or mineral in its nature, and with regard to the origin of this there has been some diversity of opinion among scientific men. Arago was, we believe, the first to suggest that it might be of "cosmic" or meteoric origin; and this view has since been accepted by Nordenskjöld, Tissandier, and other eminent physicists. It is certainly a very plausible theory. We know that immense quantities of meteoric matter are continually entering our atmosphere from the vast expanse of outer space. Meteors, small or large, are to be seen on almost every clear night; and at certain periods "showers" of these mysterious bodies are familiar phenomena. That they are solid bodies we know from the masses that now and then reach the earth, — the "meteoric stones" of our museums, often weighing hundreds of pounds, and sometimes several tons. It is natural to suppose that the minor bodies of the same kind, the "shooting stars" that we see every night, are merely minute portions of similar matter, dissipated into vapor by the heat generated in their swift passage through the upper air, and that they must finally be cooled and condensed into dust, and reach the earth in that form.

This theory has seemed to be confirmed by the fact that the atmospheric dust is often found in localities far from the abodes of men, as in the Arctic regions. Nordenskjöld collected many samples of such dust from the snow and ice fields of Northern Scandinavia, and from the most remote inland ice of Greenland. From the fact that the specimens always contained nickel-iron and other compounds associated with meteoric matter, he had no doubt that they were of cosmic origin. The similar occurrence of iron with nickel in dust that fell at Catania, in Sicily, and at Paris, examined by M. Silvestri and M. Tissandier respectively, led these observers to suppose that the dust was meteoric.

Recently, however, the investigations of M. Von Lasaulx, the eminent mineralogist, have thrown some doubt on these conclusions. He has analyzed portions of the Greenland and Catanian dust, and also some specimens from melted snow in the open fields near Kiel. In the Greenland samples he found quartz to be the principal constituent, mica being next in importance; there were also, in decreasing order of frequency, orplagioclase, magnetite, garnet, epidote, hornblende. Purely metallic substances could not be detected with the microscope. Along with the mineral particles were some small brown or brownish-green bodies, among which microscopic algæ were supposed to be present. Of these specimens he says: —

"The cryoconite of Greenland is, therefore, without doubt an extremely fine detritus of rocks rich in quartz and mica, perhaps also of a gneiss or mica-schist, with little felspar. The felspar may have easily disappeared first. The dust may thus undoubtedly have come from the gneiss region of the coast of Greenland. In any case there appears to be no trace of minerals which unmistakably point to volcanic origin, — for example, augite and olivine. Nor, besides the quite small proportion of iron, are there mineral particles present which would indicate a cosmical meteoric origin. On the contrary, the great predominant minerals are precisely those which have hitherto been as good as unknown in meteorites, namely, quartz and mica."

In the dust from Catania, M. Von Lasaulx found chiefly argillaceous, quartzose, and calcareous particles. The first were most abundant and largest; quartz splinters and granules were also numerous; calcite was less prominent; then, in much smaller quantity, there were little plates of gypsum; particles of metallic iron were in yet inferior amount; lastly, there were rare particles of plagioclase, augite, olivine, and microcline. The main constituents were all such as might have their origin within Sicily. Only the iron particles, very subordinate in quantity, could be regarded as cosmical bodies; while the rare augite and olivine crystals would be more correctly referred to Mount Etna.

In the dust from Kiel, finally, particles of metallic iron or magnetite could be attracted with the magnet, and there were also dark particles which gave a manganese reaction. With these were the predominating quartz, and red or yellow colored argillaceous particles; there were also rarely particles of felspar, mica, and hornblende. Hence, except the little iron present, there was in this dust also no trace of minerals which indicate a non-terrestrial origin.

M. Von Lasaulx sums up his analysis of these specimens as follows: —

"If we now group the observations of the various dust-masses precipitated from the atmosphere, it first appears that, in nearly their whole mass, these varieties of dust consist of mineral particles, which may be very well regarded as a detritus of rocks more or less near. Only the metallic iron, present always, but in very small quantity, can be considered cosmic.

"Now, it is remarkable that, while the majority of falls of meteorites observed hitherto have brought mineral compounds to the earth in which, with silicates, there was metallic iron present only in small quantity, and iron masses proper were a much more rare occurrence, — in this supposed cosmical dust, there should not be a trace of meteoric silicates, but, on the contrary, only iron. Moreover, it must be thought highly probable that, if cosmical matter, similar to that of aërolites, occurred in greater or less proportion in these varieties of dust, the latter would show a similarity of the mineral particles belonging to them. But these varieties of dust are complex mineral compounds, varying according to the regions in which they have fallen, and, in all of them, quartz, the mineral which resists weathering longest, plays the principal part."

M. Von Lasaulx next considers the question whether the presence of metallic iron, even when containing nickel and cobalt, proves cosmical origin, and arrives at a negative answer. After the great iron mass of Ovifak was regarded by many scientists as terrestrial, small iron particles in dust could not be considered a proof of its cosmical origin. In favor of its terrestrial origin is the fact that in the places where metallic iron has been found on the earth, organic matters (hydrocarbons) have been always present also, and these may have furnished the means of reduction for the iron. Similarly, organic substances have been met with in the iron-containing dust.

In conclusion, M. Von Lasaulx says: —

"Thus I believe that we have every reason seriously to doubt the cosmical origin even of this single constituent, to which alone such origin might be assigned, and *to explain atmospheric dust simply as detritus*. In no case can we draw from the occurrence of this dust any far-reaching conclusions, and ascribe to it a certain importance for the maintenance of our earth, an increase of the earth's mass, etc.

"The foregoing investigations also furnish proof that the accurate determination of the mineral particles of such atmospheric dust must not be neglected in future, but carried out with great care in each case, so as to gain an ever-widening and correct knowledge of dust and its origin."

ORIGINAL CHEMICAL INVESTIGATIONS.

CHEMISTRY has reached a point where it may be said that the accidental discoveries have all been made. Henceforth it is only as a reward of careful, painstaking research that great truths will be discovered. The American, in his greed for gold, has been accused of neglecting this important branch, namely, original research. In all the educational laboratories of Europe most of the student's time and attention is devoted to research, and in most of the universities an original investigation of some sort is a prerequisite to graduation. In this country the student scarcely knows the true signification of the term research. Although we are younger and far behind our German cousins, there are laboratories of research here too, notably at Johns Hopkins and Harvard universities. Beside this immature student work, there are hundreds of *real* chemists in America, who are quietly and unobtrusively grinding away on the everlasting problems that form the basis of science. From time to time we see their names here and there in the chemical journals. Some of them are working in the laboratories of the large universities, others in obscure garrets and cellars; some are making use of the well-equipped laboratories of Paris, Berlin, and Zurich, others are ostensibly engaged in manufacturing, but carry along research at the same time.

Although many of our countrymen publish the results of their labors in the widely circulated foreign journals, there are a sufficient number who do not to sustain a bi-monthly of chemistry, — *The American Chemical Journal*. This journal, under the management of Dr. Ira Remsen, has now entered fully on its third year.

Although the most valuable original papers are usually the driest reading for all except their own authors, we propose to devote a small space each month to a *very brief* résumé of the work done by Americans, whether at home or abroad, and

shall be grateful to those workers who will furnish us with short abstracts of their original papers for this purpose.

CONSERVATION OF ELECTRICITY.

We have heard a great deal about conservation of energy; that force, like matter, is indestructible; and now our attention is directed to the fact that electricity, although it is, says Thompson, neither matter nor energy, is of the same nature. The doctrine of conservation of electricity teaches us that we can neither create nor destroy electricity, though we may alter its distribution, may make more to appear at one place and less at another, may change it from a condition of rest to that of motion, or may cause it to spin round in whirlpools or vortices which themselves can attract or repel other vortices. According to Thompson's view, all our electrical machines and batteries are merely instruments for altering the distribution of electricity by moving some of it from one place to another, or for causing electricity, when heaped up in one place, to do work in returning to its former level distribution. Lippmann recently read a paper before the Paris Academy in which he advanced similar views, which he had arrived at independently of Thompson.

METEOROLOGY FOR JULY, 1881.

The sum of my observations on the weather for the past month has been as follows: —

Average Thermometer.		Lowest.	Highest.	Range.
At 7 A. M.	65.61°	60°	73°	13°
At 2 P. M.	75.26°	60°	85°	25°
At 9 P. M.	67.39°	59°	73°	14°
Whole month	69.42°	59°	85°	26°
Last 13 Julys	70.71°	65.64° in 1867.	74.36° in 1876.	8.72°

The average barometer for the past month was 29.891 inches; the lowest, 29.52, and the highest 30.20, a range of .68 of an inch. The sum of the daily variations was 3.20 inches, giving an average daily movement of .103 of an inch. The average for the last nine Julys has been 29.914 inches; the lowest 29.891, in 1881, and the highest 29.943, in 1874, a range of only .052 of an inch, and showing July, like June, to be very near the yearly average, 29.919.

The face of the sky in 93 observations gave 56 fair, 14 cloudy, 17 overcast, and 6 rainy. The amount of rain was 2.95 inches. The average for the past 13 Julys has been 3.19 inches; the lowest 1.43, in 1874, and the highest 6.85, in 1876, a range of 5.42 inches. The largest rainfall the past month was .85 of an inch, on the 26th. The remaining 2.10 inches fell on nine other days in small quantities, well distributed. Soon after four o'clock P. M. on the 4th we had a severe hail storm, coming up from the east. The hail fell in considerable quantity, with a strong wind, and did much damage, not only breaking glass, but cutting down vegetation, injuring fruits, grains, vines, etc. On several occasions, especially on the 21st and 26th, the rain was attended with heavy thunder and sharp lightning, which struck in several instances in this region, and did some damage.

The direction of the wind gave an excess of 24 southerly and 51 westerly observations over the northerly and easterly, indicating the average direction, approximately, to be west 25° 15′ south, or nearly W. S. W. This is in close harmony with the July winds for the last thirteen years, the average having been west 26° 55′ south. In only one instance (1880) has there been a northerly excess, and then by only four observations.

I may notice, briefly, that the past month has been the coldest July in this region for the last eighteen years, with two exceptions, 1865 and 1867, and yet the papers represent the present as the hot year. This may be true of some other sections of country, but cannot apply to New England, as seen by the above table; and if we compare the first seven months of this year with the corresponding months last year, the latter exceed the former by 34 degrees. With us last year was the hot year, rather than the present, and yet the years 1877 and 1878 averaged about the same, being unusually warm. Thus different regions widely differ the same season, though comparatively side by side. The cold and the hot waves often modify the general temperature of the regions over which they pass, and hence, perhaps, these singular results. D. W.

Natick, *August* 8, 1881.

EDITORIAL NOTES.

English Schoolhouses. — The annual meeting of the Church Schoolmasters and Schoolmistresses' Benevolent Institution was lately held at Lambeth Palace, and presided over by the Archbishop of Canterbury. His Grace stated, as a proof of the necessity of such a society, that the working life of persons engaged in teaching was much shorter than that of members of other professions; and that one reason of this was said to be ill-ventilated and crowded rooms; and he added, "I never entered one of these rooms which was not ill-ventilated."

It would appear that English schoolhouses are about as bad in this respect as our own. A friend who has seen a good deal of the latter remarked to us not long ago that the new Chauncy Hall School building in this city was the only one he had ever visited that was thoroughly ventilated.

An Ignorant Teacher. — A medical correspondent sends us the following: Ought not teachers in public and other schools to have a commonplace knowledge of chemistry? I read in a recent paper of a female teacher in a Pennsylvania school who put wood ashes in the mouth of a child, six years of age, to punish him, as she said, for telling a lie. Can a person be regarded as competent to teach who does not know the common fact, familiar to an Alabama negro, that ashes and water will form caustic lye? The child's mouth, lips, and throat were fearfully excoriated. Comment is unnecessary. I believe that the education of our children in the physical sciences should be commenced with plain, cheap apparatus and simple, attractive experiments at an early age. Useful knowledge thus inculcated is not forgotten.

A Big Fee. — A correspondent in Worcester sends us an amusing account of a "case" he had not long ago. Late one Saturday a young darkey rang his office bell, and said he had "got some rheumatisms." He was almost doubled up with pain from acute sciatica, which was relieved after half an hour's treatment with electricity. "How much, boss?" asked the grateful patient; and the doctor named a fee considerably less than the regular one. It was more, however, than the dusky debtor could find in his pockets, besides being evidently more than he expected. "How much did you think it would be?" inquired the doctor. "Well, boss," was the reply, "about ten cents, 'cause that's what they charge for shocks in the street." He was allowed to depart without paying anything, though he promised — and of course forgot — to come round with the money on Monday.

The Climax of the Antiseptic System. — The *Lyon Médicale* is responsible for the following: At the most recent duel the adversaries were about to cross swords, when a voice called upon them to stop. It was that of the surgeon in attendance, who, imbued with modern ideas, taking from his pocket a bottle of carbolic acid, carefully wetted the points of the weapons. He then exclaimed, with the air of a man who had done his duty, "Proceed now, gentlemen; you may kill each other, but, at all events, you are safe from purulent infection."

LITERARY NOTES.

Professor Benedikt's work on *Brains of Criminals* has been translated by Dr. E. P. Fowler, of New York, and is published by Wm. Wood & Co. The author attempts to trace the relation between fundamental defect in the brain, such as deficient gyrus development and excess of fissures, and the inclination to faulty action. In the introduction we find this statement: "An inability to restrain themselves from the repetition of a crime, notwithstanding a full appreciation of the superior power of the law (society), and a lack of the sentiment of wrong, though with a clear perception of it, constitute the true principal psychological characteristics of that class to which belongs more than one half of condemned criminals. Crime is in no way analogous to monomania, but results from the physical organization as a unit." The numerous photographs of brains that appeared in the original have been reproduced by the photograving process for the American edition.

We have also received from the same publishers a copy of the *édition de luxe* of their *Catalogue of Medical Publications*, bound in red satin, and containing the daily programme of the International Medical Congress held in London, August, 1881. This edition was prepared for presentation to the delegates to that congress.

F. W. Helmick, Cincinnati, Ohio, sends us *Helmick's American Juvenile Speaker and Songster*, which has been prepared to supply the public schools of America with a variety of useful matter for daily use, Friday afternoon exercises, and exhibitions. We believe it will prove acceptable to teachers generally, while the price, 40 cts., places it within the reach of all.

Dr. C. E. Page's little book on *How we Fed the Baby* is one of the most sensible books on that subject that we have seen, although we do not entirely agree with him. We recommend it to the careful attention of parents as well as physicians.

A new edition of *Watts's Electro-Metallurgy practically Treated* is published by H. C. Baird & Co., at $1.00. *Urquhart's Electroplating* may be obtained of the same publishers at $2.00.

We have received the 12th *Annual Report of the Cincinnati Board of Trade and Transportation*. It forms a neat volume of 216 pages and contains many valuable statistics.

The *Transactions of the American Ophthalmological Society* for 1880 contains, among other valuable memoirs, an illustrated description of the apparatus employed by Dr. Wm. Thomson for detecting color-blindness.

We have received No. 6 of *Education*, a bi-monthly magazine published by the New England Publishing Co. Among its contents we notice a paper on Natural Science in Common Schools, by Mary R. Alling, which should be widely read by teachers, parents, and trustees of schools.

The *Chemistry of Medicines*, by Prof. J. U. Lloyd, of Cincinnati, Ohio, will prove a valuable aid to those whose thankless task it is to teach chemistry to medical students.

Among the numerous text-books that usually appear at this season we notice an American edition of Rev. Dr. Abbott's *How to Tell the Parts of Speech*. It has been revised by John G. R. McElroy, and is brought out in convenient form by Roberts Bros., Boston.

We are indebted to Ginn, Heath & Co., of this city, for a little manual on wood working entitled *How to Use Wood-Working Tools*. It has been prepared for the Industrial School Association of Boston, and aims at giving only an elementary training in the manipulations common to all wood-working trades. Lessons like these, given at the same time with the studies now pursued in our grammar schools, would relieve the weariness of purely mental exercises, and give a new zest to their pursuit. We cannot do better than to give the title of each of the fourteen chapters into which the book is divided: 1, striking; 2, splitting; 3, cutting; 4, planing; 5, sharpening; 6, adjusting the plane-iron; 7, marking and lining; 8, scoring and paring; 9, sawing; 10, reducing warped to plane surfaces; 11, producing plane surfaces that are square with each other; 12, boring; 13, joinery; 14, finishing. The book contains a number of useful illustrations of how to perform these various operations.

The Comedy of Errors and *Cymbeline* have been added to Mr. Rolfe's edition of Shakespeare since the issue of our last number. Twenty-five volumes are now ready, and *Antony and Cleopatra* is all in type. The edition will probably be completed in little more than another year.

Teachers will be interested to learn that Professor Gillet and Mr. Rolfe are rewriting their well-known series of "The Cambridge Physics." The *Natural Philosophy* and *Elements of Natural Philosophy* (the latter corresponding to the old *Handbook of Natural Philosophy*) will be ready in September. They are in no sense a "revision" of their predecessors, but entirely new and independent books, differing from the others both in matter and in method of presentation. They are also more fully illustrated, the *Natural Philosophy*, for instance, having two colored plates and 508 wood-cuts. They will be published by Potter, Ainsworth & Co., of New York.

Medicine and Pharmacy.

ALCOHOL AS A FOOD.

WHETHER doctors will cease to disagree upon the subject of alcohol in medicine and dietetics before the millennium we will not venture to predict; but continued investigation and observation are gradually settling some points that have long been disputed. That persons in perfect health are better without alcohol, even in moderate quantities, than with it, is pretty generally agreed; and that it has a positive value in disease is denied only by certain extremists among medical authorities. The following extracts from a paper recently read before the Philadelphia County Medical Society by Dr. H. C. Wood, the editor of the *Philadelphia Medical Times* (printed in full in that excellent journal), will, we believe, commend themselves to the great majority of our professional readers, while they cannot fail to be of interest to others: —

Although I hold that the habitual use of alcohol is to well-fed persons not only unnecessary, but positively harmful, it seems to me that in many cases of illness and in those periods of life when by reason of age the body waxes weak, alcohol is possessed of great value. Under sixty years of age the daily employment of wine may for most persons be very well discountenanced; but after this period has been reached, I believe the moderate employment of stimulants is very useful. The progressive failure of bodily powers points to the use of a substance which shall aid in digestion and readily supply force. In the later years of life even the narcotic influence of alcohol is of value, easing the restlessness, the slight discomforts, the suffering of nerve-failure incident to failing vitality.

The question whether alcohol has food value in disease is one not easily answered by positive evidence, because the narcotic properties of the substance are so marked as often to mask its influence as a food, and because we rarely dare to employ alcohol except with an abundance of other food. The principles already outlined are, however, as applicable in disease as in health. Recent researches in fever have determined that the excessive heat production is dependent upon excessive changes in the stored materials of the body, and it is improbable, though not impossible, that alcohol is capable of taking the place of these, and, by being, as it were, vicariously burned, saving the tissues. The value of alcohol in low fevers, therefore, probably depends upon other qualities than its usefulness as a food, although our knowledge of fever processes is yet so imperfect that it is necessary to speak with great reserve.

In chronic wasting diseases I believe alcohol has an actual food value, besides being a most powerful aid to the digestion of other food. Arguments upon this point do not seem required, and it is, of course, very difficult to give actual clinical proofs, because we always employ alcohol with other foods and remedies.

The question as to the best method of administering alcohol when it is used for its sustaining powers is of vital interest.

Two general propositions will, I believe, command almost universal assent. First, the alcohol must be given in a dilute form; second, it should be given along with other food. Provided these two rules are observed, I do not think it makes much difference in what form the drug is administered. In chronic diseases malt liquors have both advantages and disadvantages. They represent food and drink, are less apt to be abused than are stronger liquids, and by virtue of their bitterness have some tonic properties; on the other hand, they sometimes disagree with the stomach. As they contain some nutritive material, there is perhaps more tendency to administer them apart from food than there should be. The amount of solid constituents in a pint of malt liquor varies from over two and a half ounces of dry residue in the strongest English ales to three quarters of an ounce in the weakest ales and beers. The ales and beers usually drunk in this city probably range from one to two ounces of solid contents to the pint. The nature of much of this solid matter is not known, but albumen, bitter and resinous principles from the hop, earthy salts, grape sugar, glycerin, and a number of complex acids have been recognized in it. The tendency to grossness seen in beer-drinkers undoubtedly largely depends upon the solid constituents of the beer which is taken, and seems to me to indicate the proper medical use of malt liquors, namely, that they are especially to be employed in wasting diseases, that is, where there is tendency to the loss of the bodily fat.

In regard to the choice of malt liquors, I do not think there is any other than what we may call personal ground for selection. That which suits the palate best usually suits also the stomach best. The choice should always settle upon the ale, porter, or beer which can be used with least inconvenience to the stomach; and when all malt liquors produce "biliousness," that is, gastro-intestinal derangement, wine or diluted spirits should be substituted. As the malt liquors contain nutritive material, it is less necessary to give food with them than it is with whiskey or wines. Nevertheless, it is preferable in most cases that food should be taken with the ale or beer.

MILK DIET FOR THE SICK.

MISS E. R. SCOVIL, whose admirable articles in the *Christian Union* on food for invalids we have several times quoted, gives the following practical directions for preparing milk in various forms for the invalid: —

Let me feed a sick patient, and who will may give the medicine. In all illness far more depends upon the proper feeding of the sick person than is generally believed. If the strength is sustained from the beginning by nourishment, given judiciously, there is a better prospect of its being equal to the demand that must be made upon it later.

Begin, then, from the first to give liquid nourishment in small quantities frequently. It is more easily swallowed and digested than anything solid, however delicately prepared, and as there is generally thirst, it is, as a rule, readily taken. The chief reliance must be placed on milk. One pint is equal to a full-sized mutton chop, and it is incomparably more nourishing than any animal broth, not excepting beef-tea, that has too long held a rank to which its merits are far from entitling it.

Boiling meat coagulates the albumen, the principal nutritive element, converting it into a solid which is carefully eliminated when the broth is strained, leaving behind a mass of shreds floating in water. Milk, on the contrary, contains fourteen per cent. of solid matter, and is rich in the constituents necessary to supply the wants of the system. One eighth part lime-water added to the milk will prevent it from disagreeing with the most fastidious stomach. Where there is no nausea a small tumblerful may be given every two hours. If there is the slightest tendency to sickness it must be omitted for an hour or two, and then resumed in very small quantities, a tablespoonful or less being given, iced, or as cold as possible, every half hour until the disagreeable feeling has passed away. If the sick person is fond of milk, he will take it for some time without growing weary of it; when it begins to pall the nurse must tax her ingenuity to make a change. If stimulant is ordered, it may be put in the milk. A teaspoonful of sugar with a few drops of essence of vanilla, alternated with essence of lemon or rose water, makes a pleasant variety. If tea and coffee are permitted by the physician, enough of either to flavor the milk may be added without producing any injurious effect.

When the yolk of an egg cannot be borne, the white may be given with perfect impunity. Albumenized milk is prepared by shaking in a wide-mouthed bottle or jar one pint of milk with the whites of two eggs. These are so thoroughly incorporated by this process that few would suspect their presence, and the mixture is much more nourishing than the milk alone. A delicious egg-nogg is made by beating the yolk of an egg separately and adding to it three teaspoonfuls of sugar with the juice of half a lemon squeezed on it; when well mixed the milk is poured in; the white, beaten to a stiff froth with a small teaspoonful of sugar and a few drops of lemon juice, is heaped on the top or beaten through the milk, according to the fancy of the maker. Orange juice may be substituted for the lemon, or sherry used to give it flavor when stimulant is allowed. Albumenized water is a refreshing and at the same time a nourishing drink. It is prepared like the milk, by shaking together the whites of two eggs and a pint of cold water, and flavored with lemon juice, a slice of lemon being left floating in the glass. Cold toast-water can be used to make it.

Sometimes when an invalid is tired of milk in every other form he will take it in the shape of ice-cream; not the deleterious compound consisting principally of corn-starch, and in which the cream is conspicuous by its absence, but wholesome home-made ice-cream, with nothing in it but good, rich cream, pure sweet milk, white of eggs, — the yolks should be omitted except for convalescents, — a little sugar and flavoring. . . .

A thin boiled custard, made with two eggs to a pint of milk and given cold, is a pleasant change. Oatmeal, Indian meal, and barley gruel, made with plenty of milk, are desirable articles of diet. If chocolate or cocoa can be borne, a little added to the milk will disguise the taste of which the palate has grown weary. In short, milk being the staple, there is practically no limit to the various ways in which a clever nurse can disguise it, to the great comfort and benefit of her patient, who would be more surprised than any one if he were told he was living principally on milk and eggs.

DR. SQUIBB ON TINCTURE OF CHLORIDE OF IRON.

H. W. L, a correspondent in this city, sends us the following note enclosing one from Dr. Squibb, which will interest physicians and pharmacists:

Much fault has been found by physicians during the past few years on account of the uncertain effects produced by the several different preparations of tincture of chloride of iron; so much so that the writer was induced to investigate the matter, and in the course of his inquiries addressed a letter to Dr. Squibb. His answer covers the ground so fully that I am led to send it for insertion in the JOURNAL. It is as follows: —

"In regard to tinct. chl. iron the last committee of revision of the U. S. P. made a mistake which is to be corrected in this revision. Tinct. chloride of iron is not fit for use until at least six months old. I never send out any that is less than six months old, and have now changed to make it a year old. An important part of its therapeutic value depends upon ethers that are generated slowly from the large excess of HCl [hydrochloric acid] and the alcohol, and any one who will compare the sensible properties

of an old with a recently made tincture will see how very different they are. The present U. S. P. therefore, in permitting the acid solution of the chloride to be kept and sold separately, so that the pharmacist can make up his tincture as he wants it, makes a great mistake, and on that account I have never made nor offered the solution of the U. S. P. for sale.

"The solution of chloride of iron of my list is a very different thing, and is the old Pravaz solution, which has been used chiefly for surgical purposes since the time of Pravaz, and the second mistake of the U. S. P. was in adopting an incorrect name for its highly acid solution, and thus confusing it with a solution in common use which is very carefully made normal, or free from the smallest excess of acid. This solution (of my list) contains fifty per cent. of normal neutral chloride of iron, and from being normal does not do to make tincture at all: *and much alcohol has been wasted in trying to use it.* This however was not my fault, though perhaps I ought to have dropped it from my list when the U. S. P. took the same name for its acid chloride. There have been many mistakes made and much harm done also on the other side of this matter by surgeons prescribing for their uses the liq. ferri chloridi and of course getting the U. S. P. solution, which from its abundant free acid was very hurtful in surgical use. E. R. SQUIBB."

HOME TREATMENT OF COLDS.

A "LAY" writer in a London journal gives the following practical suggestions on this subject, under the heading "Never Poultice for a Cold:" —

The past severe winter has left behind it a plentiful crop of complaints of the respiratory organs, and I am induced to offer the above advice, having experienced the evils of poulticing throat or chest, more especially in the case of children. It is a too common practice for doctors, when called to a case, to recommend poultices; they are, however, bitterly paid for in the future. I have known several children who were poulticed, who suffered from croup each winter after until they attained their teens; and also grown-up people who so weakened throat and chest by injudicious poulticing that they were thereafter annual victims to complaints of the respiratory organs. To persons of weak chests I would recommend a small square, say a quarter of a sheet, of cotton wadding, worn over the chest in the winter months. Last winter but one, I had two children suffering from scarlet fever, one of them being badly affected in the throat. The doctor ordered poultices, but I demurred, and stated my objections. He agreed with me in the main, and consented to allow a trial of my substitute, namely, a flannel soaked in salad oil wound round the throat, with a dry flannel on the top, to keep the oil from the clothes; the same application to the chest. The next morning he agreed that the remedy had been better than the poultice would have been. At that time the eruption of the skin was at its height, and occasioned the children much discomfort, so I asked the doctor's permission to rub the bodies with the oil. He agreed to this, provided I did the rubbing myself, or superintended it, for, said he, without care it might be fatal, with care it will have the best results. Having made up a good fire and fastened the bedroom door, to prevent the possibility of its being opened during the operation, I folded the children in a flannel wrapper, and gradually rubbed them from head to foot with salad oil. The effect was wonderful on the parched skin, and they both went peacefully to sleep. Next day they begged for a repetition of the oil rubbing, and I continued it until after the peeling process had been accomplished. As the doctor said, the benefits are great, and the only danger lies in the risk of taking cold. This with care can be reduced to the minimum. So with colds affecting throat or chest. A flannel soaked in either cold-drawn castor oil or salad oil, and worn round the throat and on the chest at night, will have a much more salutary effect than poultices, and will entail no bad after results. To persons who are subject to frequently getting wet, a rubbing of either of the above oils would be found salutary in keeping off colds, and when rubbed into the joints in checking or alleviating rheumatism.

SOMETHING NEW IN CHILD-POISONING.

WITH the progress of science the conveniences for "the murder of the innocents" are rapidly mutiplying, and it is a lucky child that escapes them all. If the infant does not suck death from its nursing-bottle, it is likely to have fresh opportunities for involuntary suicide in its first playthings, made of poisoned rubber or colored with dangerous pigments; and if these do not answer the purpose, new means of making way with itself will be furnished at every step in its future career. As a little addition to these facilities for shuffling off the mortal coil at an early age, it has been recently found that the colored crayon pencils now so much used by children are colored by poisonous dyes, and those who use them should be taught not to put them in the mouth. The following case is given by Dr. Cameron, in the Dublin *Journal of Medical Science* for July, 1881: —

A child was taken with severe vomiting, and appeared to be suffering acutely. On closely examining the vomited matter, very small particles of a green substance, brighter than biliary matter, were observed in it. On touching them with solution of ammonia they acquired a deep blue color, showing the presence of copper, and therefore, probably, of arsenic. Precipitated ferric hydroxylate, $Fe_2(HO)_6$, was promptly prepared and administered to the child, as were also ipecacuanha, a little mustard, and abundance of warm water. The washing out of the child's stomach was continued until the disappearance of the green particles from the vomit, which, however, did not take place for more than two hours. In order to dislodge the poison from the bowels a purgative was administered. The egesta were found to contain numerous bright green fragments, and they did not disappear until the end of the second day. The child was feverish, restless, and sleepless for about forty hours, after which he became slowly better, but was not convalescent until about the seventh day. His abdomen was tympanitic, his features were shrunken, and the cerebral symptoms were severe. On three occasions the patient nearly died from collapse. He recovered after about a month. It was found, on examination, that he had eaten a portion of a green-colored crayon, which, on testing, was found to be colored with *arsenite of copper*, the amount of arsenious acid being 1.72 per cent.

CARBOLIC ACID IN CARBUNCLE.

DR. E. BODMAN, of Sidney, Ill., sends us the following note: —

Some years ago you gave my mode of treatment of carbuncles or boils by injecting carbolic acid in dilute form into the tumor by means of the hypodermic syringe. I noticed at the time that the article was copied into medical journals in different parts of the country. Since then I have used it successfully in various morbid growths. For felon or whitlow it has never failed in my hands. I am careful to get it on the bone. I add one eighth of a grain of morphine to each injection. The relief of pain is usually instant, and a complete *cure* at first injection. The use of large quantities of undiluted acid in carbuncles I think is attended with danger of thrombosis which can just as well be avoided.

THE LATE PROFESSOR SKODA.

THE *Staatszeitung* gives a short sketch of the life of the late Josef Skoda, the son of a locksmith, who was born in Pilsen, in the year 1805. His youth was one of hard struggles. At the age of twenty he repaired to Vienna, to pursue the study of medicine, graduating in 1831. His straitened circumstances induced him to accept a position as circuit physician, during the cholera epidemic in Bohemia, but subsequently he returned to the capital, where he entered the general hospital as an assistant. His scientific career dates from this period. As early as 1835 we find him elucidating the mysteries of physical diagnosis to classes of eager students. In derisive allusion to his use of the stethoscope, the higher powers of the hospital conferred upon him the title of "the master with the little post-horn." His immortal work on auscultation and percussion, upon whose principles the diagnosis and management, not only of diseases of the thoracic viscera, but also of wounds of the abdominal organs, are based, was ignored by those in authority. He afterward took charge of a newly established department for thoracic diseases. To the professorship he was not appointed until 1847, but long before this he contributed largely to the fame of the Vienna Medical School. From all parts of the world poured in those who were anxious to perfect themselves in auscultation and percussion; even gray-haired doctors condescended to play the student's rôle once more under Skoda. In 1848, at the founding of the Academy of Sciences, he became a member of the institution. In 1871, ill-health forced him to resign his professorship.

Skoda was a man who never sugar-coated his bitter pills, but the public recognized the reliability of his diagnosis and the fact that his blunt manners and his precise way of speaking made him appear harsher than he intended. He remained single all his life; his unbounded love for science crowded out every desire for domestic happiness. When Rokitansky died, Skoda, bowed down with physical and mental pain, accompanied his friend's remains to the grave. "Why must *I* still live?" he said, in his calm but indescribably expressive way, to those who, with heavy hearts, endeavored to console him. Now he also has passed away. Skoda and Rokitansky will be remembered as long as man shall continue to study medicine. Never, in scientific history, have there been found two friends who criticised each other so impartially, and complimented each other's labors as thoroughly, as these.

Some of the anecdotes about Skoda are a good index to his character. One day he was invited to dine at court. After having delivered his lectures and attended to his patients, he repaired thither in his customary, well-worn, old-fashioned apparel. "But the Herr Professor might have appeared with a frock-coat," reproachfully intimated the official charged with the reception of the guests. "Well, then," said Skoda, "I 'll ride home and send my frock-coat here to dine." Upon another occasion, by ministerial decree, certain changes were to be made in the hospital, the utility of which Skoda denied, in spite of the Burgomaster's opinion to the contrary. "Your Excellency," he said bluntly, "we physicians are the best judges of such things." The angry retort that the government was paying the money, and intended exclusively to control it, was met by the argument that the funds belonged no more to the government than to the medical authorities, but that they were the property of the tax-paying multitude, who looked to the opinion of competent persons as to the disposal of them. Skoda, ever since his student days, was in the habit of

attiring himself in exceedingly antiquated style. Decades passed by, but the cut of his "inexpressibles" remained the same, in spite of the bantering remarks of his friends. One day, however, to the great surprise and amusement of every one, the great clinician appeared in an elegant pair of pantaloons, of faultless style. "As a student," he explained, "I lived with a tailor, who rendered me a good many services and greatly assisted me, so I always remained his customer. He had his own antiquated notions about cutting goods, but I wore them as they were cut. The poor man is dead now, and *I* — have to wear fashionable pantaloons." For a pain in the foot, Skoda employed a salve prescribed by a colleague. Questioned as to the result of the treatment, he remarked, "Where I applied your salve, the pain was arrested, but where I did not, *it ceased much sooner.*"

SELECT FORMULÆ.

ARTIFICIAL FRIEDRICHSHALL WATER. — The following formula is said to give a very close approximation to the natural bitter water of Friedrichshall: —

Soda bicarb.	⅞ ounce.
Soda sulph. (cryst.)	1 ¼ ounces.
Potas. sulph.	⅜ ounce.
Mag. sulph. (cryst.)	20 ounces.
Sodium chlor. (pure)	10¼ ounces.
Calcium chlor. (anhydrous)	1 ounce.
Distilled water	q. s.

Mix the bicarb. and sulphate of soda with the sulphate of potash by rubbing them together in a mortar, add the sulphate of magnesia, and dissolve in three pints of water. Then add the other salts with sufficient water to form a solution. Pour the liquid into a fountain containing twelve gallons of water, and charge moderately with carbonic acid gas. It is then ready for bottling.

IPECAC DINNER PILL. — Dr. J. M. Fothergill says in the London *Practitioner:* "Ipecacuanha formed a portion of a good old-fashioned dinner pill; and betwixt its direct action upon the gastric mucous membrane and its action on the liver as a hepatic stimulant it must come into use again before long. A dinner pill of —

Pulv. ipecacuan.	gr. i.
Strychniæ	gr. 1-20.
Ol. pip. nig.	minims ij.
Pil. al. et myrrh.	gr. ijss.

every day, will often produce excellent effects. Then arsenic may be taken, as three drops of Fowler's solution after dinner, or in the above pill, substituting the same dose of arsenic for the strychnine."

EAU DE COLOGNE SOAP. — The following is a German formula: —

White soap [Castile]	2000 parts.
Oil of lemon	8 "
" neroli	4 "
" sweet orange	6 "
" rosemary	1 part.
" thyme	1 "
" petit grain	2 parts.
Essence of civet (30 grams of civet to 1 liter of alcohol)	4 "

ANTI-MOSQUITO FUMIGATING PASTILLES. — A German pharmaceutical journal gives the following recipe: —

Charcoal	500 parts.
Saltpetre	60 "
Carbolic acid	40 "
Persian insect powder	250 "
Tragacanth	q. s.

MARSHMALLOW SYRUP. — The following formula is highly commended: —

Marshmallow root, cut	50 parts.
Cold water	500 "
Sugar	750 "
Orange-flower	30 "
Simple syrup, sufficient to make	1300 "

Rinse the root lightly with water, then macerate it a few hours with the cold water; strain without pressure, adding enough water through the strainer to make the strained infusion equal to the original measure; set it aside to settle, decant the clear liquid, and in it dissolve the sugar with the aid of heat. After straining the syrup, and when it has cooled, add to it the orange-flower water, and enough simple syrup to make the finished preparation weigh 1300 parts.

ARTIFICIAL CARLSBAD SALT. — The following, which differs slightly from a formula previously published in the JOURNAL, has the sanction of the Swedish Pharmacopœia: —

Chloride of sodium, powdered and perfectly dry	100 parts.
Bicarbonate of soda	300 "
Sulphate of soda, exsiccated	1000 "

Mix thoroughly, and keep in a well-closed bottle.

MISCELLANEA.

A HINT FOR DRUGGISTS. — The following, sent by a druggist to *New Remedies*, may serve to emphasize the importance of always being "on the safe side," in dispensing dangerous medicines: —

"Last evening, the daughter of a retired druggist, whose family I have known for several years, handed me the enclosed piece of paper with the handwriting of her father: —

Morphium sulphur. gr. x
pro me *****

"Without further inquiry I put it up, labelled it properly with a red poison label, and handed it to the lady. A few minutes afterwards she returned, and asked for 10 grains of sulphate of *quinine*, saying her father made a mistake in writing *morphium* instead of *chininum!*

"Imagine the consequence if I had thought, 'It will do without a label, as the druggist knows what he sends for,' or if he himself or his daughter had not noticed the conspicuous label before administering the supposed 'quinine'! I thanked God for having averted such terrible consequences from two families, and that I had strictly obeyed the law in regard to the sale of poisons."

AN EXPLOSIVE MIXTURE. — Not long ago, according to the London *Chemist and Druggist*, an explosion of an extraordinary nature occurred at the shop of Mr. Field, druggist, in Wigan. A woman went to the shop and asked the assistant for a mixture of spirits of nitre and vitriol. The assistant declined at first to supply the mixture, stating that the spirits would burst the bottle, and that she would get badly burnt. The applicant said she had procured the mixture before for cleaning buttons and other articles, and pressed the assistant to prepare it. The assistant at length made up a mixture of spirits of nitre and vitriol, but no sooner had he corked the bottle than the contents exploded, and burnt him severely about the eyes, and also Mr. Field's lad. The applicant and a domestic servant who was waiting to be served were seriously burnt on the face.

ACUTE RHEUMATISM IN A CHILD NINE MONTHS OF AGE. — Rheumatism is so rare in the earlier years of life as to be hardly even mentioned by such writers as West and Vogel. Dr. Garden, in the London *Practitioner*, gives the case of an infant of nine months who caught cold from bathing in cold water. Rheumatism followed, affecting the knee and ankle joints. These were wrapped in cotton, and three grains of salicin thrice daily were prescribed. The patient recovered in a fortnight, without showing any signs of heart-complication.

GLYCOLIN. — Etard has obtained from glycerine, by acting upon it with ammonium chloride at a high temperature, a new base, to which he gives the name of glycolin. Its composition is represented by the formula $C_6H_{10}N_2$.

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Special Notices.

THE attention of our musical friends is called to an advertisement, on page 5, of the "New England Conservatory of Music," a Boston institution worthy of all praise.

THE Harwood Chair Seat Co. offer on page 4 a durable and economical device for reseating chairs.

THE advertisement of Shinn's Liquid Rennet can be found on page 3. Mr. Shinn is a well-known and skilful pharmacist in Philadelphia, the products of whose store are considered to be "always reliable." For invalids, children, or for culinary use the rennet is always ready and easily used. Be sure and ask for "Shinn's."

MCKEAN, NEWHALL & BORIE advertise on page 2 for a Chemist to superintend their sugar refinery.

"FRIENDSHIP," Cicero says, "is the only thing in the world concerning the use of which all mankind are agreed," but all writers agree that a good pen is a desideratum, and Esterbrook's are the standard.

CEPHALINE will cure sick, nervous, and bilious headaches. It relieves at once.

ANY one troubled with deafness should not fail to investigate the merits of the Earphone. This little article, small, light, and attractive, can be carried in the pocket, and is always ready for use. Made of metal, finished in nickel, they are indestructible. This invention, when placed to the ear, enables the wearer to hear ordinary conversation in a clear, distinct, and natural tone with the speaker at a distance of forty feet or more. They may be seen and examined at the office of W. C. Rogers, 99 Court Street, Boston.

LANSING'S new mica labels are advertised on page 4. These useful and handsome styles of labels are sold by F. Stearns, a reliable pharmacist of long standing in Detroit, who is always on the alert for new and valuable articles. Druggists and apothecaries who are starting anew or who are making a renewal of their old labels would do well to send for specimens.

HORSFORD'S ACID PHOSPHATE — A summer drink. Put a teaspoonful of Acid Phosphate in a glass of water, sugar to taste, and you have a delicious drink that is more healthful than any made from lemons or limes, and a deal more gratifying to the thirsty recipient.

SCHOOLS OF PHARMACY. — A few years ago these institutions were nearly unknown, but now they are considered a necessity, and have increased in proportion to the demand for a higher grade of qualifications of the dispensing clerks of our pharmacies. We take pleasure in noticing the advertisement of the Massachusetts College of Pharmacy which appears in the present number of the JOURNAL, on page 6. This institution is one of the oldest in the country and is giving the benefit of its experience to all who are able to join its classes. It offers superior accommodations to most other colleges in centrality of location and economy of expenses, by which means it is able to give extra inducements to students.

We have received the announcement of the Albany College of Pharmacy and welcome the new claimant to pharmaceutical honors, and hope that it will find room in its circle to show its faith by its works in establishing and maintaining an institution which shall be an honor to itself and a help to the fraternity of pharmacists.

Boston Journal of Chemistry
AND
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Familiar Science.

STRANGE SHOWERS.

A CORRESPONDENT who is interested in the article on "Atmospheric Dust," in the last number of the JOURNAL, expresses a desire to know more about the manner in which these heavy particles are carried up into the air, to fall in showers upon the adjacent country. He remarks incidentally that "of course the accounts of showers of toads and other small animals that occasionally appear in the newspapers must be regarded as either mistakes of observation or sheer fabrications."

On this latter point, however, he is in error. Doubtless many stories of the kind have been hasty inferences from imperfect observation. It is a vulgar belief in rural districts that the small toads which are sometimes seen in unusual numbers after a rain have fallen from the heavens with the rain. Nobody has seen them fall, but there they *are;* and to the illiterate it is quite as natural to suppose that the rain has brought them down from the sky as up out of the earth. But when we *do* see the creatures fall, there can be no doubt on that point; and not a few instances of such strange showers have been recorded by scientific men in various parts of the world. M. Peltier states that he once saw a fall of small toads in France. They fell upon his hat and his hands, and the ground about him was covered with them. Several trustworthy observers in France, India, and other lands have seen showers of small fish descend from the sky. Some fifteen or more years ago, great numbers of small sticklebacks fell in South Wales, sprinkling the earth and the roofs over an area of several square miles. They were alive when they fell, though they must have been conveyed through the air a distance of at least thirty miles, as there was no place nearer than that from which they could have come. In the Isle of Mull, on the coast of Scotland, within the memory of the present generation, herring were once found plentifully strewn over a hill more than a quarter of a mile from the sea and a hundred feet above it.

These fishy showers are most frequent in tropical regions, where violent whirlwinds are common. In India, fishes weighing from a pound to three pounds each have been known to fall, sometimes still alive, but oftener dead. They are always of such species as are found in the neighboring waters; and it cannot be doubted that they have been carried up into the air by whirlwinds. In 1835, the water of a small pond in France was entirely drawn off by a whirlwind. In the pond were a great many fish, which must have gone up with the water, to come down again with it. In 1833, near Naples, a whirlwind passed over an orange-grove, carrying up a good deal of the fruit in its rapidly rotating current; and some minutes afterwards the people at a considerable distance from the spot were astonished by a shower of oranges on their housetops. These are only a few out of many curious and well-authenticated instances of the kind.

In volcanic regions, as the reader is doubtless aware, immense quantities of ashes, dust, and mud are often thrown up in eruptions, and transported for miles by atmospheric currents before they descend to the earth. Pompeii, which is about five miles from Vesuvius, was not overwhelmed by lava streams, as was the case with Herculaneum, but was buried beneath the vast volumes of ashes and mud which the winds swept in that direction. In 1845, the dust and ashes from an eruption of Hecla were thickly deposited on some of the Orkney and Shetland Islands. In January, 1835, ashes from the volcano of Conseguina in Nicaragua fell in the streets of Kingston, 700 miles away on the island of Jamaica; and during the same great eruption a district thirty miles from the mountain was covered to the depth of more than ten feet with fine dust, destroying all vegetation and killing myriads of birds and other animals.

The phenomena of hail-storms illustrate the sustaining and transporting of comparatively heavy masses in the air. Hailstones sometimes weigh a pound or more, and it is inconceivable that they should be formed while falling directly from the upper regions of the atmosphere. They would fall from a height of three miles in less than three minutes, which is too short a time for the production of such masses of ice. These large hailstones, moreover, are generally made up of alternate layers of compacted snow and transparent ice, sometimes several of each, showing that they have been formed by a succession of processes, during which the mass must have been sustained in the air in opposition to the force of gravity. The most probable theory of their formation assumes that they have been kept up by swiftly ascending currents of air. A velocity of less than a hundred feet a second would be sufficient to sustain a sphere of ice two inches in diameter, and such a velocity in air currents is nothing very extraordinary.

The formation of hail is invariably attended by two distinct currents of air, one of which displaces the other with great violence. The current of air which precedes the approach of a hail-storm is extremely hot, and highly charged with moisture; and that which succeeds the fall of hail has an icy chilliness. The warm and humid air is displaced by the cold current, and is thus forced up to a great height, by which means its vapor is suddenly condensed. Upon the front of the hail-cloud this condensed vapor exists in the form of water, whose temperature is near 32°. In the interior of the cloud the vapor is precipitated in the form of snow, whose temperature may be as low as 20°.

Observations on mountains have shown that on the front of the hail-cloud there is a violent whirling motion about a horizontal axis. This causes the snow to collect in small balls, each of which forms the nucleus of a hailstone. The snow-ball is forced into the warm current, where it receives a layer of water, which is congealed by the nucleus, thus rendering the snowy centre more compact, and adding a shell of transparent ice. By the whirling motion, the hailstone is then hurled into the snow-cloud, where it receives a layer of snow, and again becomes thoroughly chilled. Thence it escapes again into the water-cloud, and is covered with a layer of water, which is frozen by the cold of the nucleus. Thus it is plunged alternately into the snow-cloud and the water-cloud, while each alternation furnishes a layer of spongy ice and a layer of transparent ice. Hence the stone grows rapidly, and in a few minutes becomes a ball three or four inches in diameter. It is sustained in the air by the violent upward motion caused by the cold current displacing the warm one.

The facts given in this familiar discussion of the subject will, we think, satisfy our friend, and other readers of the JOURNAL, that no meteoric theory is required to explain the fall of dust from the upper air, since far heavier masses may both be lifted up into the air and whirled for great distances through it; and it will be seen that all the reptilian and other strange showers to which we have referred are easily accounted for on simple scientific principles.

CREMATION OF AN ITALIAN PROFESSOR. — Dr. Ferdinand Colletti, Professor of Therapeutics at Padua, died a short time ago. He was cremated at Milan with high honors. He was one of the early champions of cremation.

CONCERNING FLUORINE.

It was known nearly two hundred years ago that glass could be etched by exposing it to the fumes produced by the action of sulphuric acid on the mineral called fluor-spar; but it was not until the present century that the nature of the chemical reaction in the process was understood. Until the time of Ampère's investigations, in 1810, it was supposed that the acid attacking the glass was an oxygen compound; but that chemist showed, as Davy subsequently did, that the acid was analogous to hydrochloric acid, being a compound of hydrogen with an element existing in the fluor-spar in combination with calcium. This element was named *fluorine*, and the fluor-spar, formerly known as fluate of lime, was designated as fluoride of calcium.

This fluorine is interesting from the fact that (setting aside certain "new metals" whose oxides have been "discovered" within the last few years, but whose existence is still hypothetical) it is the only element that has not been isolated. Many attempts have been made to obtain it in its simple form, but without success.

It is easy enough to decompose its compounds, but impossible to prevent it from immediately entering into new ones. It attacks glass and the metals, so that the chemist is at a loss to find a material for vessels in which to prepare or confine it. It unites at once with platinum, which is proof against so many chemical agents. Davy heated dry fluoride of silver with chlorine gas in a platinum vessel, and got for his pains a fluoride of platinum. He tried the same experiment in a glass tube, and obtained chloride of silver, but the released fluorine attacked the glass, entering into combination with its silicon. For this latter element it has an extraordinary affinity, and its action upon glass is due to this fact. Glass is a silicate, or a compound of silicic acid with soda, lime, and other metallic oxides. The fluorine decomposes the silicic acid (SiO_2), and forms with the silicon the volatile tetrafluoride of silicon (SiF_4). Davy suggested that vessels of fluor-spar should be used for the decomposition, and the experiment has been tried; but the fluorides used were not perfectly dry, and the provoking element united with the hydrogen of the water to form hydrofluoric acid. A German scientist heated iodine with fluoride of silver in a glass tube, and said he obtained iodide of silver and a colorless gas, which he supposed to be fluorine; but the English chemist Gore, who investigated the whole subject most carefully, found that perfectly dry fluoride of silver is not decomposed under a red heat by chlorine, bromine, or iodine; while if a higher temperature is employed, a fluoride of the metal — platinum, gold, silver, or whatever the vessel may be made of — is formed. If tubes of graphite or charcoal are used, a fluoride of carbon is obtained. The difficulty of making vessels of fluor-spar adapted to the purpose has prevented further experiments with that material; and for the present the chemists have to confess that they are baffled in all their attempts to isolate this singular element.

Fluorine is also unique among the elements in not combining with oxygen. It is remarkable that, with its powerful affinities for so many other elements, it should be utterly indifferent to one which is equally omnivorous in its chemical appetite.

It has just been announced in foreign journals that Loew has discovered the presence of free fluorine in a certain variety of fluor-spar, found at Wolsendorf in Bavaria. This spar is dark violet in color, and has a peculiar odor, which scientists have attempted to explain by various theories, but not very satisfactorily. Loew came to the conclusion that the odor might be due to free fluorine; and, to test his hypothesis, he ground a kilogram of the Wolsendorf spar with water containing ammonia, using small portions at a time, the filtrate and wash-waters from the earlier being used with the later quantities. The last filtrate was mixed with sodium carbonate and evaporated; the residue treated in a platinum capsule with sulphuric acid, and, covered with a watch-glass, kept at 40° to 50° C. for a long time. On examining the glass it was found to be considerably corroded. Since fluor-spar is not entirely insoluble in water, the experiment was repeated, using the inodorous mineral. The result was so exceedingly feeble as to dispose entirely of this objection to the former result.

Since the odorous spar contains cerium, Loew believes that the free fluorine is produced by the spontaneous change of ceric fluoride into cerous fluoride and fluorine. We shall want, however, to know that his experiments have been repeated and verified by others before we believe in the free fluorine or accept this theory of its origin. It would certainly be curious if an element which chemists have made so many unavailing attempts to isolate is really found free in nature under their very noses. Even if it is, the smell of it may be all that they will get in any attempts to collect and examine the gas. We shall see what we shall see, as the pious Turks say.

EXPERIMENTS FOR YOUNG CHEMISTS.

BY PROF. E. J. HALLOCK, PH. D.

I.

Some considerable experience as a teacher has led to the conviction that it is impossible for a person to acquire any real knowledge of chemistry without laboratory practice. To touch and to handle, to weigh and to measure, to smell and to feel, in fact to observe with all the senses, is very essential in the study of chemistry. There is scarcely a teacher of science in common or high school, in city or country, who could not make this branch exceedingly attractive by providing means for the class to experiment for themselves. That this opinion is generally received is evident from the appearance of several small text-books, notably those of Professor Appleton and Mr. Jones, intended as guides to these exercises.

For the benefit of those of our readers who are teachers, and wish to introduce such exercises into their classes, as well as for those who wish to experiment at home, we propose to offer a list of simple yet instructive experiments that can easily be performed in the school-room or the garret, at a very small expense, and with but little danger.

APPARATUS.

Each student should have a small set of apparatus, costing from $2.50 to $5.00, as follows: —

One half dozen six-inch test tubes; one half dozen four-ounce wide-mouth bottles; one deflagrating spoon; one two-ounce retort, stoppered; one three-inch funnel; one funnel tube; one evaporating dish; one alcohol lamp (or gas burner); one beaker glass; one retort holder or ring stand; corks, glass tubing, filter paper, etc.

If the class is large, it may be divided into sections of ten each, and five sets of apparatus will suffice for that number.

If there is no laboratory, the teacher should obtain for common use a few pieces of more expensive apparatus, namely: —

One balance and set of weights; one Bunsen battery of two cells; one decomposition-of-water apparatus; one Liebig's condenser and support; one graduated cc. (cubic centimeter) measure.

Of these, the first two are quite necessary; the others may be extemporized by the ingenious teacher. If metric weights are not easily attainable, they may be constructed as follows: Take a piece of clean, thick brass or copper wire, and cut off a piece that will weigh just five grams. New nickel five-cent pieces can be used as five-gram weights. Divide the wire into exactly five equal parts: cut off three of these to serve as one-gram weights; the other piece is bent into a V and kept for a two-gram weight. A piece of fine wire cut to weigh one gram can be divided into ten parts for decigrams. Other simple methods of making weights will suggest themselves. It would be well for each student to prepare a set of weights for himself, the larger ones from sheet lead, the smaller from tin or lead foil; remembering that if ten square inches of lead foil weighs one gram, one square inch will weigh 0.1 gram = 1 decigram, and one half square inch will weigh 0.05 gram = 5 centigrams. By means of the weights a set of measures can be extemporized by remembering that one cc. of pure cold water weighs one gram. A six-inch test tube holds about twenty-five cc., or twenty-five grams of water. For measures of length the nickel again comes in use, it being two centimeters in diameter. The meter measure is best made by carefully measuring off 39.37 inches on a bar of hard wood, and dividing this into ten equal parts.

Most of the chemicals required can be purchased as needed at the nearest drug-store. Dealers in large cities will put up, for five dollars, chemicals sufficient to supply quite a large class.

The teacher can employ the first two or three meetings in instructing the class in the use of the balance, and allowing them to construct their own weights and measures. A few examples of determining specific gravity of solids and liquids can also be given at this time. Take a small vial, and balance it accurately; then fill it with water, and find the weight of the water; empty and dry the bottle, and fill it with ether, alcohol, oil, acid, or brine, and weigh again. The weight of the latter divided by the weight of water will give the specific gravity. A bit of granite is suspended by a horse-hair and weighed. A glass of water is placed under the scale beam so that the rock hangs immersed in it, and again weighed. The first weight in air divided by the loss of weight in water will give its specific gravity.

OXYGEN.

A piece of glass tubing sixty centimeters in length is bent at right angles about five centi-

meters from one end, and at an angle of 135° at the same distance from the other end. Pass one end, that bent at right angles, through a good cork, softened by boiling in water or in paraffine, or, better still, through a rubber stopper, which will fit the test tube. Weigh out exactly one gram of potassium chlorate, $KClO_3$; put it in the

Fig. 1. Preparation of Oxygen.

test tube, and heat carefully, holding the other end under the surface of the water in dish or soup-plate. Having previously filled two wide-mouthed bottles and a test tube with water, invert them over the water in the dish for use. When bubbles of gas begin to be given off, collect one or two test tubes full. At first it is only air that is expelled from the test tube. Soon these bubbles will reignite a glowing splint. Collect the gas, which is oxygen, in the wide-mouthed bottles. If they are filled too full they will tip over. Continue heating until no more bubbles of gas appear; then remove the glass tube from the dish, to prevent the water rushing up the tube and breaking the hot test tube. Sometimes the test tube itself is melted. Instead of holding the apparatus as shown in the figure, it is better to suspend it from the ring of a retort stand; or a stiff piece of wire can be bent so as to hold it. Paste a strip of paper on each bottle to show how much gas it contains, before proceeding to make any experiment with it. The usual experiments of burning a taper, sulphur, or phosphorus may be made in one bottle of the oxygen, but the other should be preserved over water until the next meeting.

The chemical reaction of making oxygen is as follows: $KClO_3 + \text{heat} = KCl + O_3$.

The residue should be potassium chloride. Dissolve some of it in water when cold, and add a solution of silver nitrate; the white precipitate, which is soluble in ammonia, proves the presence of a chloride. Potassium chlorate does not give this reaction.

The experiment of making oxygen can be repeated by mixing one gram $KClO_3$ with one gram of *pure* manganese dioxide, MnO. The heat required will be less. When cold, the residue may be dissolved out of the test tube and filtered. The insoluble manganese dioxide will be found to weigh as much as it did before. The quantity of oxygen obtained in this experiment will be the same as in our first one. We will ask our readers to find out how much oxygen they ought to obtain from a gram of potassium chlorate, knowing the atomic weights to be as follows: Potassium 39.1, chlorine 35.5, oxygen 16.0.

One liter of oxygen weighs 1.43 grams. How much potassium chlorate will it take to make one liter of oxygen?

Next month we shall explain how to calculate this, and then describe the preparation of hydrogen gas.

INVERTED SUGAR IN THE KITCHEN.

NOTWITHSTANDING all the good words that have been spoken in favor of pure glucose, we think that very few housewives would purchase the article for putting up their preserves, knowing it to be only one third as sweet and more liable to ferment than cane sugar. Yet many a careful housewife *inverts* her cane sugar, thus destroying two thirds of its sweetening power, and rendering it in no respect better than grape sugar. As we have often had occasion to state, the action of acids upon cane sugar at a moderate heat (140° F.) is to convert it into *invert sugar*. Hence, in cooking acid fruits, a great waste of sugar is experienced if it is added to the fruits while hot, or cooked in them. Probably some of our readers have already noticed this effect, and will be glad to know how to avoid the loss.

SCIENTIFIC BREVITIES.

SIR ISAAC NEWTON ON THE VALUE OF SLEEP. — The following quaint letter from Sir Isaac Newton to a medical friend has only been recently published: —

"LONDON, December 15, 1716.

"DEAR DOCTOR — He that in y^e^ mine of knowledge deepest diggeth, hath, like every other miner, y^e^ least breathing time, and must, sometimes at least, come to terr; alt for air.

"In one of these respiratory intervals I now sit doune to write to you, my friend.

"You ask me how, with so much study, I manage to retene my health. Ah, my dear doctor, you have a better opinion of your lazy friend than he hath of himself. Morpheous is my best companion; without 8 or 9 hours of him y^r^ correspondent is not worth one scavenger's peruke. My practizes did at y^e^ first hurt my stomach, but now I eat heartily enow as y' will see when I come down beside you.

"I have been much amused by y^e^ singular *φενομενα* resulting from bringing of a needle into contact with a piece of amber or resin fricated on silke clothe. Y^e^ flame putteth me in mind of sheet lightning on a small — how very small — scale. But I shall in my epistles abjure Philosophy whereof when I come down to Sakly I'll give you enow. I began to scrawl at 5 mins from 9 of y^e^ clk, and have in writing consmd 10 mins. My Ld. Somerset is announced.

"Farewell, Gd bless you and help y^r^ sincere friend, (Signed) ISAAC NEWTON.

"To Dr. Law, Suffolk."

AN ELECTROPLATED BRAIN. — A brain, preserved and metallized by the galvanoplastic method, was lately presented to the French Academy of Medicine by Dr. Oré, of Bordeaux. The brain, having been so arranged that the circumvolutions are well separated, by introducing cotton wicks into the fissures, and so that the preserving liquid may penetrate the ventricles, is kept about a month in alcohol at 90 degrees, so as to acquire good consistency; the wicks are then taken out. The brain is now plunged for ten minutes in an alcoholic solution of nitrate of silver (100 grams per liter of alcohol), and carefully drained in air. Next, it is transferred to a case in which sulphuretted hydrogen is liberated, and it takes a dark hue, owing to formation of a surface deposit of sulphide of silver. In about twenty minutes it is taken out, and after exposure a quarter of an hour in air it is put in the galvanoplastic cell, where it soon assumes a fine metallic aspect.

RELATION OF THE NOSE TO THE FACE. — A somewhat singular fact has been observed with reference to the shape of the nose, or rather the setting of it in the face, so to speak. To be strictly correct, from the artist's point of view, the nose should be accurately in the middle of the face, and at right angles with a line from the pupil of one eye to that of the other. As a matter of fact, it is rarely or never thus placed; it is almost invariably a little out of the "square," and the fact of its being so is often that which lends a peculiar expression and piquancy to the face. A medical writer points out that there are anatomical reasons why a slight deviation from the true central line may be expected, and that the nose which is thus accurately straight between the two eyes may, after all, be considered an abnormal one; the only absolutely true and correct organ being, in fact, that which deviates a little to the right or left.

CATCHING A TARTAR. — A large whale has just been reading a short lesson on an old theme to the inhabitants of Walls Island, Orkney, and even to mankind at large. This whale in his gambols ran himself ashore, when the islanders turned out in a body with knives, pitchforks, and every accessible instrument of attack; and, after satisfying themselves, by inflicting innumerable stabs, that he was dead, proceeded, by help of the rising tide, to tow him with their boats into harbor. The whale, however, with a union of stoical endurance and diplomatic craft hitherto unrecognized in the species, had been biding his time, and no sooner regained his own element than he rushed out to sea, dragging the fleet of screaming Orcadians behind him. To be hoist with your own petard is bad enough, but to be abducted by your own whale is worse; and the people of Walls, after three miles of an involuntary voyage, managed to cut the ropes and escape from the formidable sea Tartar whom they had caught. From this adventurous incident the Walls Islanders and all who are willing to profit by the experience of others may learn how unsafe it is to contend with whales in their own waters, or with men on their own ground, and, generosity apart, how imprudent it is to be cruel to the helpless, since there is no telling how formidable they may become when their opportunity arrives.

DELICATE IRON WORK. — The precision to which scales and tools are now made is most wonderful. A bolt has been made to fit so delicately into an opening in a piece of iron that when the bolt has been held for a short time in the hand the expansion is so great that it cannot be made to enter except by the use of much force; yet, when at the normal temperature, its own weight will settle it to its seat. The scales used for weighing gold in the Assay Office at New York are so delicate that, when brought to a balance with two pieces of paper of equal size in the pans, the mere writing of a name with a lead pencil on one of the pieces of paper will add enough weight to the paper to turn the scales in its favor.

COLORING WHITE FLOWERS. — A correspondent of *Vick's Floral Monthly* says: A very pretty experiment is performed by putting the stem of a freshly-cut tuberose, or other white flower, into diluted scarlet ink for a short time. The liquid will be drawn up into the veins, coloring them in a very pleasant manner. It is also instructive, showing whether a plant is net-veined or parallel-veined. A tuberose colored not too highly makes a very pretty novelty. I gave one to a young lady, who wore it in a mixed assembly, where it attracted considerable attention. Among those interested was an amateur botanist, who entered into a lengthy explanation of how he supposed the matter to have been accomplished by hybridizing, and considerable merriment was caused when the truth was revealed. I discovered this process accidentally, and the ink mentioned is the only color I have found fine enough to pass into the pores of the flowers.

A CANINE TANNER. — A French paper states that the Rhenish regiment of artillery, No. 8, quartered at Metz, left that city on June 1st for the

Wahner Haide, for exercise in field manœuvres, shooting, etc., and returned on July 9th, having been thirty-nine days absent from barracks. Upon opening one of the rooms, which had been locked up while the regiment was away, a quartermaster found a dog belonging to the regiment lying on the ground, still alive, but in a state of extreme weakness and emaciation. How it lived is a mystery; of ordinary food, or even water, it can have had none. There were evidences that the poor brute had gnawed some pieces of wood lying in the room. It was so weak that it could not even lap, and for two days it was fed with milk through a tube. But it quickly rallied, and within ten days it was able to take food as formerly.

The Steamboat invented by a Frenchman. — At a recent séance of the French Academy, M. de Lesseps, in the name of a committee, reported on the title of Claude, Marquis de Jouffroy, to the national gratitude in connection with steam navigation. About 1770, Claude de Jouffroy made, and tried on the Doubs, a boat driven by steam. A few years after, in 1780, he resumed his efforts at Lyons, before the Academicians of that town, and went up the Saône on a large vessel moved by steam. Fulton, who has the honor of having started on the Hudson, in 1807, the first regular steamboat service, knew of Jouffroy's experiments, and on two separate occasions, in 1802 and 1811, recognized his merits. Denis Papin, before Jouffroy, had devised and constructed a boat moved by steam, with which he hoped to go to England, starting from Cassel on the Weser. A stupid crowd, however, destroyed his work before it could be tried. The committee, pointing out Jouffroy's priority, express the wish that his merits may be nationally recognized, and that a statue may be erected to him, in Besançon (as proposed by that town), by public subscription.

HOUSEHOLD HORTICULTURE.

A Hint for Window Gardening. — A recent English writer gives the following, which suggests a way in which hardy wood climbers might be made available for window decoration in winter or early spring: "Some years ago, as I was passing through a room used only occasionally, I perceived an odor of fresh flowers that surprised me, as none were ever kept there. On raising the curtain of the east window, I saw that a branch of Dutch honeysuckle had found its way between the two sashes at one corner while growing in the summer, and had extended itself quite across the window; and on the branch inside there were three or four clusters of well-developed flowers, with the usual accompaniment of leaves, while on the main bush outside there was not yet a leaf to be seen. The flowers inside were just as beautiful and fragrant as if they had waited until the natural time of blooming. Since then I have tried the experiment purposely, and always with the same result." A heavy covering of the ground over the roots of the plants with leaves and sufficient protection of the stem outside would allow this method to be practised in quite severe climates.

White Clover as a Basket Plant. — An English gardener recommends the white clover, *Trifolium repens*, as a hanging-basket plant for winter. He claims that it is of easy culture, quickly makes large plants, and looks well from Christmas onwards, and that he has raised several seedlings that are improvements on the ordinary type. We all know how valuable white flowers are in early winter, and, no doubt, even white clover would be prized then; for the white blossoms are really beautiful, and if rare would be highly prized.

The Eucalyptus as a House Plant. — Prof. J. L. Budd thinks the *Eucalyptus globulus*, which has done such wonders in arresting malarial disease on the fatal Roman Campagna, and in other places, acts not only by the immense transpiration from its leaves, which soon distil the juices of the soil, but from actual antiseptic emanations, and by the absorption of deleterious gases. Wounds are healed and foul sores purified by an application of the leaves. He advises their growth as a house plant, and says that a plant of his in an eight-inch pot, three years from the seed, remains at about five feet without losing its large, handsome leaves.

Practical Chemistry and the Arts.

STORING UP ELECTRICITY.

The one thing needed to make electricity practically useful in a small way was a suitable method of bottling it up, so that it could be sold by the quart, like milk. Faure's battery encouraged the hope that such would some day be the case. Now we are told, by the *Cleveland Leader*, that Charles Brush has succeeded in perfecting a method of storing this peculiar form of energy. He uses metal plates, so arranged that they are capable of receiving very large charges of electricity and holding it for an indefinite time. It is stated that in a given space he was able to store twice as much electricity as Faure. The details have not yet been made public.

All we need now is a large electrophorus, which shall accumulate enough electricity during a thunder shower to light the city until the next shower. It is well known that every large structure on the earth's surface becomes strongly electrified by induction while a cloud charged with electricity hovers over it. If at this moment it could be insulated from the earth it would retain its charge indefinitely, and could be used to charge a Faure or Brush battery. Or, why not charge the battery at once from the clouds, as Franklin charged his Leyden jars?

AN INGENIOUS APPLICATION OF THE MAGNET.

One of the American contributions for the Electrical Exhibition at Paris is a modification of Mr. Edison's magnetic separator for the treatment of iron sand, found in large quantities on the southern shore of Long Island, and in other localities on seacoasts. According to Mr. Batchelor, the Long Island sand contains 26 per cent. of the finest iron known. Innumerable attempts have been made to separate the sand, and magnetic plates have been used before, but with no success, on account of the presence of what is known as titanite iron, a substance which spoils iron. Edison discovered that titanite iron was less magnetic than the pure iron particles, and constructed his separator with that fact in view. The sand falls a distance of four feet in a thin stream from a slit in a V-shaped box holding about a ton. Under this box is a receiver divided into two compartments, the dividing partition being placed nearly under the slit in the sand reservoir, and parallel to it. If no magnet is brought into play the sand all falls into one side of the box; but when a powerful magnet is brought near enough to act upon the falling shower, the pure iron particles are deflected in their fall and fly on the other side of the partition. The particles of titanite of iron are not attracted equally with the iron, and are not deflected sufficiently to fall into the compartment with the pure iron. A company has been formed for the extraction of iron from Long Island sand, and is now at work with its first machine at Quogue, near Moriches, on the great South Bay. This machine, which cost $700 to make, is managed by one boy, who keeps six men and two carts busy bringing sand for his hopper. It treats, we are told, one hundred tons of sand a day, producing about twenty tons of pure iron, costing one dollar a ton to produce, and selling for six dollars.

INDUSTRIAL MEMORANDA.

Paper Plates. — An English journal says: The latest application of paper is the adoption of paper plates by some of the great restaurants in Berlin, Germany. The innovation was first introduced during the summer of last year by the adventurous landlord of a much-frequented open-air restaurant. Every customer who ordered bread and butter, rolls, cakes, buns, or similar articles, had them served to him upon a paper plate, made of a light *papier maché*, adorned with a pretty border in relief, and having at a first glance a great similarity to porcelain. Guests, waiters, and hosts were all pleased with the novelty; it saved the waiters many a deduction from their wages on account of breakages, which the deftest and cleverest of *Kellners* can scarcely avoid when he handles hundreds of pieces of crockery during a single afternoon and evening. The paper plates were so cheap that the landlord did not care to assert his ownership over them, and his customers were allowed to carry them away. There was also a considerable saving of the time lost, and the chances of accident incurred, in the cleansing of the earthenware pottery. The success of the experiment has been so marked that the new species of plates is likely to be introduced into a great number of restaurants.

Cost of Gas in American Cities. — The Buffalo *Express* gives an interesting table of the price paid for illuminating gas in some of the principal cities in this country. In five of the seventy-three cities on the list, private consumers pay the same as in New York, — $2.25 per thousand; in twenty-one cities the price is less, and in forty-seven it is more. Pittsburgh stands first, with gas at $1 per thousand, and Ithaca next at $1.20. Then follows Allegheny $1.25, Cleveland $1.65, Poughkeepsie $1.75, Columbus, O., $1.80, and so on. There seems to be no fixed ratio between the size of the town and the price of gas. In most cases gas is sold to cities at a somewhat lower rate than to private consumers, but Dubuque, Iowa, is a very noticeable exception, for there the city pays $7 per thousand, while the consumer is charged $3.50.

The Electric Light in London. — *Design and Work* says that when the Jablochkoff light on the Victoria Embankment was first installed, the charge was sixpence per lamp per hour; but, as the experiment went on, and the new order of things settled down, the price was reduced, and it now stands at three halfpence per lamp per hour, about the same as that paid for gas.

Malleable Brass. — This, says the *Berg. u. Hüttman. Zeitung*, is made by alloying 33 parts of copper and 25 of zinc, the copper being loosely covered with the zinc in the crucible. As soon as the copper is melted, zinc purified by sulphur is added. The alloy is then cast into moulding sand, in the shape of bars, which are malleable into any form while hot.

Artificial Stone. — The composition of the artificial stone from which the articles exhibited in the Paris exhibition by M. Dumesnil were made is said to be as follows: In 110 gal. of water are dissolved 15½ lb. of alum, 13½ lb. of slaked lime, and 2¼ lb. of yellow ochre, to which is added 2¼ lb. of glue dissolved in 1 gal. of hot water. In this mixture 198 gal. of plaster-of-paris are tempered, and then half the quantity of fine river sand, free from clay, is added. This preparation, according to the *Journal of the Society of Arts*, run in moulds, sets

in about twelve hours, and acquires great hardness. To protect the building blocks, thus obtained, from the action of rain, it is sufficient to give them three coats of silicate of potassa dissolved in water.

A Railroad in the Tree-Tops. — A California journal says: It may not be known outside of the neighborhood where it is situated, but it is nevertheless a fact that in Sonoma County we have an original and successful piece of railroad engineering and building that is not to be found in the books. In the upper part of this county, near the coast, may be seen an actual roadbed in the tree-tops. Between the Clipper Mills and Stuart's Point, where the road crosses a deep ravine, the trees are sawed off on a level and the timber and ties laid on the stumps. In the centre of the ravine mentioned, two huge redwood trees, standing side by side, form a substantial support, and they are cut off seventy-five feet above the ground, and cars loaded with heavy saw-logs pass over them with as much security as if it were framed in the most scientific manner. There are many places in our redwood forests where this example might be followed profitably, as it would be cheaper to grade through with a cross-cut saw and lay the ties on the stumps than to remove the trees. We can boast of a broad-gauge, a narrow-gauge, and a road in the tree-tops, — yet we are not all happy.

Quantity of Dust in Workrooms. — Dr. W. Hesse has weighed the dust contained in a given quantity of the air found during working hours in various rooms and shops in Schwarzenberg, Saxony. Assuming each laborer to work 10 hours per day and 300 days in a year, he would inhale from 6 grams to 150 grams of dust in a year. In a flour-mill with aspirators, the workmen take in only 6.63 grams, and in a mill of the old construction, 71.55 grams. In a weaving-room with 10 looms and 36 workwomen, each got 4.5 grams, and in another only 3.52 grams. In a paper-factory, with 14 table and 28 girls, they each inhaled 34.35 grams of dust. In the cleaning room of an iron foundry each got 107.55 grams, and in another 150 grams. In a dwelling-house, the dust amounted to 6 grams per person per year.

A New Coal. — A variety of coal, said to be the most highly-carbonized member of the coal series hitherto described, has been found near Schunga, on the western shores of Lake Onega; it contains about 91 per cent. carbon, 7 or 8 per cent. water, and 1 per cent. ash. This coal is extremely hard and dense, has an adamantine lustre, is a good conductor of electricity, and has a high specific heat — 0.1922. Although containing as much carbon as the best graphites from Ceylon, it is not a true graphite, inasmuch as it is not oxidized by potassium chlorate and nitric acid, but behaves towards those reagents like an amorphous coal.

LABORATORY NOTES.

Determination of Uric Acid. — M. Petit precipitates the uric acid in 200 cc. of filtered urine by the addition of 5 cc. of fuming hydrochloric acid and stirring for five minutes. After standing some time in a cool place it is filtered through a (weighed) double filter, washed with alcohol, dried at 100° C., and the uric acid weighed.

Test for Free Hydrochloric Acid in Perchloride of Iron. — Professor Keale recommends the use of a one per cent. solution of carbolic acid. If free acid is present, a green color is produced; otherwise an amethystine color.

Sophistication of Indigo with Prussian Blue. — The following method of separating indigo from an admixture of Prussian blue is from Barfold's "Manual of Organic Qualitative Analysis:" A solution of carbonate of soda is made, which decomposes the Prussian blue, leaving in its place hydrated oxide of iron mixed with the indigo. This mixture is filtered and washed, and the iron oxide is then dissolved away with diluted muriatic acid. On filtering and washing, the indigo is left alone.

Determination of Potassium and Sodium in Crude Potash. — Hager recommends the use of picric acid for this purpose, since one part of sodium picrate is soluble in 80 parts of alcohol, whilst one part of potassium picrate requires for its solution 2500 of alcohol of 98° per cent.

Waters of the Dead Sea. — Fleck publishes in *Repert. anal. Chem.* the following result of an analysis of Dead Sea water: —

	Parts in 1000.
Potassium chloride	14.250
Sodium chloride	62.438
Sodium bromide	4.236
Magnesium chloride	108.015
Calcium chloride	29.811
Calcium sulphate	1.021
Total salts	219.771

Quick Detection of the Presence of Water in Alcohol and Ether. — If an aqueous solution of 2 parts of crystalline tartaric acid is mixed with 1 part of molybdic acid and evaporated to incipient fusion in a porcelain capsule, the deep blue mass which is formed, if heated with 30 to 40 parts of water, yields along with a fixed residue a faint yellowish-brown filtrate, holding in solution the citrate of a molybdenum compound, which has the property of appearing deep blue in its anhydrous state, but almost colorless when hydrated. If a slip of filter-paper is steeped in this molybdenic solution (not too dilute) and dried at 100°, the blue color reappears with great intensity. The paper, if screened from direct sunlight, retains its color. If it is plunged in pure water, the blue color disappears at once, the paper becomes white, and the water is not colored. At 50° the decoloration is instantaneous, at 18° to 20° in two or three seconds, and at 10° in five to eight. With absolute alcohol or ether in a stoppered bottle the blue color of the paper remains unaffected. This reagent for water is not acted on by acetone, aldehyde, methylic alcohol, and mixtures of amylic and ethylic alcohol. If plunged in spirit of wine, the blue color disappears more rapidly the more water is present.

Detection of Starch in Indigo. — If indigo is treated with chlorine water, the blue color is destroyed. Some potassium iodide solution is next added, and the liberated iodine will at once produce a blue color if there is any starch present.

Experiments with Potassium Nitrite. — Dr. Tomasi says that if 10 grams of potassium nitrite are melted in a porcelain crucible and then a small quantity of ammonium chloride is added, this salt begins to rotate with a variable velocity and then takes fire and burns with a violet flame, accompanied by a feeble detonation. With ammonium sulphate the phenomenon is more striking, but only very small quantities should be used on account of the danger from the projections. Ammonium nitrate, when in contact with melted potassium nitrite, produces a remarkable luminous phenomenon. Dr. Tomasi is engaged in studying the nature of the gases evolved.

Compound Oxygen. — In 1867 we expressed the opinion that "oxygenized air," if it differed from common atmospheric air, was absurd and empirical. We are not surprised to hear from one of our Kentucky friends that the so-called "Compound Oxygen," now widely advertised, is likewise a humbug. He informs us that he made a qualitative analysis of the substance and found it to be "simply water containing a very small quantity of nitrate of lead and ammonia only."

Nitrogen and Iron. — Prof. Ira Remsen, while experimenting upon the use of metallic iron and sodium in testing for nitrogen, found that freshly prepared iron, reduced by hydrogen, contained nitrogen, even when no ammonia was used in its preparation. Finely divided iron in the active state always gave the reaction for nitrogen, while older specimens, which had been exposed to the air a short time, did not give it. As a result of his experiments he asserts that when iron by hydrogen and certain non-nitrogenous organic substances are heated together with metallic sodium in an atmosphere of nitrogen, a cyanide is readily formed. These conditions are similar to those which give rise to the formation of cyanide of potassium in the blast-furnace.

Microlite from Virginia. — Dunnington's analysis of microlite from Amelia County shows that it contains 68.43 per cent. of tantalic acid, 7.74 of columbic acid, 2.85 of fluorine, combined with lime, magnesia, uranium, sodium, and other metals, including one per cent. of tin.

A New Vegetable Coloring Matter. — Sadtler & Rowland have been experimenting upon the coloring principle extracted from a variety of wood called *Beth-a-barra*, imported from the west coast of Africa. When pure, the coloring matter is a tasteless, yellow, crystalline substance, melts at 135° C., and dissolves in water containing a trace of alkali with a deep claret-red color. It seems to be a near relative of the coloring matters found in rhubarb and Goa powder.

Chloro-Bromide of Lead. — M. W. Iles has discovered an artificial mineral formed in the blast-furnaces of the Grant Smelting Co.'s works, which contains lead combined with chlorine and bromine, Pb. (Cl. Br.), and resembles the chloro-bromide of silver called megabromite.

Carbonate of Potash. — Engel prepares this salt from chloride of potassium (sylvine), by mixing it with magnesia, or its carbonate, and stirring up the mixture in the presence of carbonic acid gas. A double carbonate of magnesia and potash is precipitated, which is crystalline and easily drained from the mother liquors. On heating the double salt it separates into soluble carbonate of potash and insoluble carbonate of magnesia, while carbonic acid escapes. The carbonate of magnesia formed is used in the next operation.

Transformation of Dextrose into Dextrine. — It is well known that dextrine is readily converted into dextrose by prolonged boiling with dilute acid. Musculus, in a communication to the Chemical Society of Paris, states that he has accomplished the reverse of this by the action of strong sulphuric acid upon dextrine, at a temperature of 60° C. The substance thus obtained, if not true dextrine, was identical with it in its chemical and physical properties, and could be reconverted into dextrose, or glucose, by prolonged boiling with dilute acids.

What Acids dissolve Phosphates in the Soil? — According to H. von Liebig, the phosphates in soil are dissolved and rendered available by the oxalic acid, combined with potash, in the roots of plants. Therefore this chemist proposes to employ potassic oxalate instead of a citrate solution in the analysis of fertilizers. He thinks that the present method of analysis with ammonium citrate gives only a part of the assimilable phosphoric acid. This will be good news for some of our fertilizer manufacturers.

Composition of Subnitrate of Bismuth. — Hermann Thoms, in Coblenz, has recently examined the basic or subnitrate of bismuth, made according to the Pharmacopœia Germanica, by triturating the neutral nitrate in cold water, and pouring it into 21 parts of *boiling* water. The temperature makes a decided difference in its composition. Upon igniting this salt in a platinum crucible he obtained 80 per cent. of oxide of bismuth. This requires the following formula for the subnitrate of bismuth: $Bi(NO_3)_3 + 2\,Bi(HO)_3$.

Agriculture.

THE LAWN WORM.

The ravages of the lawn worm, the past summer, have been very discouraging to those who own beautiful lawns connected with their dwellings. We can bear, with some degree of equanimity, attacks upon our garden fruits and vegetables by insect pests; but when they hide themselves under the green turf of our lawns, and cut away the roots, the evil is of a nature to provoke discouragement, and almost despair. Many of the magnificent lawns connected with fine estates in the vicinity of Boston, Newton, Watertown, Cambridge, Brookline, etc., have been in the past five years almost ruined by the filthy grub worms, well known to every farmer and gardener; and the present season they have attacked our lawns at Winnekeni, and caused considerable mischief. The worms appear in countless numbers, burrowing about one and a half inches below the surface; and they march like a platoon of soldiers across a lawn, cutting away the grass roots so thoroughly that the sward can be detached, and rolled up like a thick blanket. The first intimations of the presence of the worms are the appearance of white patches of turf scattered about on the field, and as the work goes on the patches extend, until sometimes the ruin is complete. In many cases the dying of the turf is supposed to be due to the influence of drought, and no special examination is made to ascertain if other causes exist. Whenever these white patches are noticed, we advise an investigation at once; and if it is found that the sward can be lifted by taking hold of the grass, it is proof that worms are at work.

As regards a remedy we have but a few words to say. It is obvious that there are great difficulties in the way of applying remedies, as the various insect poisons are potent to destroy the grass roots, and render the field permanently barren. None of the mineral poisons can be used, and the vegetable are too expensive for general use. Whale-oil soap in dilute solution we have found effective, but the quantity demanded for a large lawn is a bar to its employment.

The best method we have found in the treatment of the lawns at Winnekeni is to roll them with a heavy roller, or pound them with a turf mallet. The worms lie near the surface, and are very soft, so that they are readily crushed by a roller or the blows of a mallet. If a lawn is gone over carefully in this way, the evil is in part or wholly removed, and this without injury to the grass. We feel that our readers having lawns will thank us for the suggestion.

THE SEASON OF 1881.

It is certain that the season of 1881 will be looked back upon by farmers everywhere in this country as one distinguished for its calamities and singularities. It has been a season of cold and wet, fog and mildew, thunder, lightning, tempests, and hail, in many sections of New England; and in others drought has prevailed, and, with the cold, frosts have appeared every month during the summer. The crops as a rule are poor the country over. Fruit, in this section, is small in size, and deficient in juiciness and flavor. Peaches have to a large extent decayed upon the trees, and those unaffected with rot are tasteless and worthless; apples look better, but the crop will not be large; grapes are destroyed by mildew; pears are small, but abundant. The corn crop is not promising in New England, as the cold season has prevented its reaching perfect maturity. Potatoes are good, and the crop is not deficient in quantity. Two crops of hay have been cut, both of which have been heavy. Bad as has been the season, there is no occasion for much complaint.

SILOS.

The work of filling silos has been accomplished, and the number now holding a store of fodder is very large in all sections of the country. The fodder used almost universally is corn, grown in drills or by broadcast sowing, and the season has been, upon the whole, favorable for its rapid growth. We fear that the old delusion of expecting to obtain "something out of nothing" influences many farmers in their silo undertakings. Those who have filled their pits with abnormal growths of the maize plant, will meet with disappointment in the results. Corn fodder grown thickly in shade and cut early is almost valueless, whether it is stored in a silo or fed to animals in a dry or wet condition. The great mass of the green plant is water and woody fibre, and holds but little of anything which has food value. Another year we predict a change to occur: there will be less of the crude, coarse Southern corn raised for silos, and more of the smaller and better varieties, and the crops will be sowed in drills and be better taken care of.

DR. LAWES ON NITRATE OF SODA.

Dr. J. B. Lawes, of Rothamsted, England, from whose papers on "Fertility" we recently quoted, contributes an article to the *American Agriculturist* for October, on "the effect of nitrogen applied as nitrate of soda upon various crops of the farm." His introductory remarks, which bring out well an important fact in plant culture, are as follows: —

If a farmer, by way of experiment, were to supply his soil abundantly with mineral manures, but, as regards nitrogen, were to leave the crop grown to depend on the amount of that substance it could obtain from natural sources, he would find that, sooner or later, the produce would decline; and if the seasons were all exactly alike this decline, although very slight, might, with sufficient care, be measured early in the experiment. As, however, the seasons differ in what we call fertility, it is quite possible that he might, after several years, obtain crops which were even larger than four of those grown at the beginning of the experiment; the decline, however, in the course of time, would be so marked that even the most fertile season would only yield a reduced produce, and the reduction would be far more rapid were it not for the efforts put forth by the plant to economize its food. No family, reduced by some reverse of fortune from affluence to poverty, ever made greater efforts than the plant to maintain a decent appearance before the world on reduced means of subsistence. At Rothamsted, by the aid of chemistry, we have been enabled to study the internal arrangement of the plant, and can see how, when scarce, it economizes one important element of food which it prefers, and substitutes another which is less palatable but more abundant.

After giving some facts and statistics concerning the use of nitrate of soda upon four crops very different in character (potatoes, mangolds, wheat, and barley), which had long received a large annual supply of mineral food (potash, soda, magnesia, and phosphates), he remarks: —

The crop of potatoes grown by the minerals amounted to a little over 4 (short) tons per acre; the application of 550 lbs. of nitrate of soda, in addition to the minerals, increased the crop to nearly double this amount. The largest crop grown in any one year by means of the nitrate and minerals combined was about 10 tons, and as the minerals alone gave abont 4½ tons we have an increase of 5½ tons due to the action of the nitrate. One hundred pounds of nitrate of soda contain 15½ lbs. of nitrogen, and one ton of potatoes contains 5 lbs. of nitrogen; if, therefore, all the nitrogen of the nitrate was recovered in the crop, an increase of 3 tons of potatoes should be obtained by the application of one cwt. of nitrate. Our largest increase, as I have pointed out, was 5½ tons, but as this was the result obtained by the application of 550 lbs. of nitrate, about two thirds of the amount applied was not recovered in the crop; of this unrecovered portion a certain part would have been employed in the growth of the leaves and stem, and another in the roots, — a very considerable proportion being either destroyed or washed out of the soil.

The gain in the barley crop is thus stated: —

The increase due to the nitrate of soda was 22 bushels, and during the last season, 1880, which was very favorable to the barley crop, the increased yield obtained by the nitrate of soda over the minerals alone was 33 bushels, the minerals giving 28 bushels, and the minerals and nitrate 61 bushels, per acre! The weight of 33 bushels of barley, including the straw, would be nearly 4000 lbs., containing about 1 per cent. of nitrogen: the 33 bushels of barley would therefore contain about 40 lbs. of nitrogen; and as the 275 lbs. of nitrate of soda would supply about 42 lbs. of that substance, it is evident that under very favorable circumstances the greater part of the nitrogen supplied may be recovered in the crop.

The conclusions to which Dr. Lawes comes, as the result of his experiments and observations, are thus summed up: —

When a large crop is obtained by the application of a mineral manure, such as potash or phosphate, it is due to the fact that the liberated nitric acid is quite equivalent to the growing power of the mineral food in the soil available for the use of the crop. After a few years' application of these minerals alone, it would be found that they were less effective than when first used; they would then accumulate in the soil, only to become the food of plants when aided by an artificial supply of nitrogen. In one of our experiments upon permanent wheat, 8000 pounds of sulphate of potash and the same quantity of superphosphate of lime have been applied to one acre of land during the last thirty-eight years; almost the whole of this amount is now lying in the soil, within reach of the crops, but unavailable for the use of the plant, owing to the absence of soluble nitrogen. Plants, then, derive their nitrogen principally from nitrate of lime formed from the organic nitrogen existing in the soil; but if a larger amount of produce be required than this nitrate is competent to supply, recourse may be had to nitric acid in the form of nitrate of soda, or ammonia, or organic nitrogen, and the value of these substances is, in some degree, in proportion to the readiness with which they are converted into nitric acid.

The general idea that nitrate of soda acts as a stimulant to vegetation is incorrect. The action of nitrate of soda is due to the fact of its furnishing plants with one very important element of their food, nitric acid; the soil furnishes the same sub-

stance, but not always in sufficient quantities, and the question as to when it will be profitable to employ so costly a substance is one that cannot be answered without a full knowledge of all the circumstances of the particular locality.

My experiments show that, even when little or no loss of nitrogen takes place from washing, a very considerable proportion of the amount supplied is not recovered in the crop: it is evident, therefore, that in the States, where nitrate is as costly as it is in England, and where a lower range of prices prevails for farm crops, some caution must be used in its application.

BEET-SUGAR ITEMS.

The Sugar Beet, a journal devoted to the interests of beet-sugar production, says that many Chinese are employed in raising sugar beets in California. The same paper adds, "This is a solution of the cheap-labor problem which has been generally overlooked in the New England papers."

We are informed that the Franklin Beet-Sugar Factory is to be sold at auction for what it will bring. This is rather poor encouragement to the friends of beet sugar.

The Delaware Beet-Sugar Company have four hundred acres of land under cultivation. They are situated from one to five miles from Wilmington, and also near New Castle. About twelve pounds of seed were sown to the acre. Many of the seed failed to come up, owing to the drill burying them too deeply. Where the seed failed to appear above ground, it was re-sowed with a small hand-drill. It is thought that the average yield to the acre will be ten and a half tons.

Excellent sugar beets have been grown at the college farm of the New Jersey Agricultural Experiment Station.

One advantage that a beet-sugar manufacturer has over the importer from Cuba, or elsewhere, is that his sugar may be placed on the market at least one month earlier, at a time when the price is the highest, and he may thereby realize the greatest profit.

GLEANINGS IN MANY FIELDS.

School Gardens. — The public-school law passed in Austria in 1869 provides that "in every school a gymnastic ground, a garden for the teacher, according to the circumstances of the community, and a place for the purposes of agricultural experiment be created." The school inspectors of each district are instructed "to see to it that, in the country schools, school gardens shall be provided for instruction in all that relates to the soil, and that the teacher shall make himself skilful in such instruction." The general law declares, "Instruction in natural history is indispensable to suitably established school gardens. The teachers must therefore be in a condition to conduct them."

Chemical Food for Plants.—A Russian journal recommends the following formula: —

	Parts.
Sulphate of ammonia	4
Nitrate of potash	2
Sugar	1 M.

About 40 or 50 grains of this powder should be added to a gallon of water, and applied to the plants once or twice a week.

Spent Hops as a Fertilizer. — It may not be generally known that spent hops are rich in fertilizing qualities and valuable for applying on light lands, where, when mixed with the soil, they assist greatly in keeping it moist and bringing about a healthy root action. Any one living near breweries, where they may be obtained for the carrying away, should not lose the opportunity of securing as many as they can use. They should be allowed to rot by very gentle fermentation, during which their decomposition may be hastened by frequent stirring.

Fir-Tree Oil Insecticide. — The *Journal of Forestry* says: We have freely tested this insecticide on all manner of insect vermin, and it has proved more than equal to our expectations. Applied according to the directions furnished with each sample, it is generally effective and safe in its use. Fir-tree oil mixes freely with water, while petroleum and other oils do not. For plants and trees it may be used with a garden engine, syringe, or brush, or by dipping; in fact, it is of the easiest application, and possesses neither poisonous properties nor a disagreeable smell.

Scale Insects in Florida. — The Florida *Agriculturist* gives hints of what the orange growers are doing there, and what they are thinking of doing. Mr. C. R. Bloomer, a large orange grower, uses the following mixture: Five lbs. of common soap and ten lbs. of sal soda, mixed in an old kerosene barrel filled with water. His trees are clean and healthy. Another gentleman, near Jacksonville, recommends the following, which he has used with great success: To four lbs. of whale-oil soap, dissolved by boiling in one gallon of water, add a handful of washing soda and half a gallon of kerosene oil. If convenient, add also an ounce of carbolic acid. Apply to trunk and branches with a flat paint brush. The editor of the *Agriculturist* adds: "We have tried passing a flame of fire through the tree, with success, not keeping it too long at any place to burn the tree. In our opinion, the best and easiest remedy would be a portable furnace and boiler with pipe, by which hot steam could be injected into the tree."

Flies and Horses. —Dr. J. J. Ridge, of Enfield, writing to the *London Daily News*, recommends, to prevent the torment inflicted by the flies on horses, application to the latter, before harnessing, of a mixture of one part crude carbolic acid with six, or more, parts of olive oil. This should be rubbed lightly all over the animal with a rag, and applied more thickly to the interior of the ears and other parts most likely to be attacked. This application may need to be repeated in the course of the day, but while any odor of the acid remains the flies decline to settle, and the horse is completely free from all their annoyance.

English Harvests. — The London *Truth* says: An acquaintance of mine farms 1000 acres. He enters in a book all expenditures and incomes of every field, and he has made the calculation that if all our land in corn has suffered during the last two years proportionately as his corn land has suffered, the last two bad harvests have cost us £150,000,000 ($750,000,000). I asked one of our most eminent agricultural calculators whether he thought this was an over-statement, and he told me that the amount was probably greater.

To Determine the Age of Hen's Eggs. — According to Leppig, the specific gravity of a freshly lain egg is between 1.0784 and 1.0942. When exposed to the air it loses water, which is replaced by air, and loses about 0.0017 to 0.0018 per day in gravity. At the end of three weeks the gravity will not be over 1.05, and it is then nearly on the point of spoiling. When the specific gravity has fallen to 1.015 the egg shows signs of decay.

English Names for Plants. — The London *Garden* declares its determination to use English words in naming plants. It will be a decided improvement, especially when proper names are introduced. Why should we not say Drummond Phlox instead of Phlox Drummondii? And why should a pretty Chinese pink be smothered under such a name as Dianthus Heddewigii diadematus flore-plenus? If the name of the originator must be used, let it be in English form and with English qualifying terms. Heddewig's Diamond Pink would certainly answer the purpose quite as well as the Latin lingo.

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, OCTOBER 1, 1881.

TWO GREAT EXHIBITIONS.

It is indeed a rare occurrence that in one city two extensive exhibitions of industrial products should be made at the same time, and that they are contained in two buildings erected specially for the purpose, at great expense. In this city we have two exhibitions now in progress: one that of the old, well-known Mechanics' Charitable Association; the other that of a new organization, the New England Mechanics' Institute. It is not worth while to stop long to consider how two rival organizations happened to exist; since they do, it is best to discuss the merits of what they have to show in the fine exhibition buildings they have erected. The buildings of both organizations are noble structures, solidly and conveniently built, and well worthy to stand as permanent edifices dedicated to industrial art.

It is understood that the building of the Mechanics' Association, which is of brick, and covers several acres of ground, is permanent, designed for the purposes of the Association, and will probably meet its wants for the next quarter of a century. Of the designs of the builders of the other we are not informed. Both of the edifices are now filled with the exhibits of artisans, manufacturers, inventors, etc., and the crowd of visitors who daily throng the halls shows how deep is the public interest in industrial progress in our country.

It would at first thought seem impossible that the two spacious structures could be filled with the products of New England skill, and that both could receive that abundant patronage which such enterprises require in order that they may be successful. But doubt no longer exists; success crowns the labors of the promoters of both enterprises.

The great results of progress in science and art were, perhaps, never more satisfactorily or fully shown, except in the gigantic accumulations found in the world's fairs, so called. New England is manifestly a grand centre of mechanical ingenuity and artistic accomplishments, and its capabilities are most clearly displayed in these exhibitions. It would be difficult to point out in detail the excellences of any one department, so extensive and varied are the collections. We would invite all lovers of the wonderful and beautiful, all who admire the highest results of man's handicraft, to visit Boston, and walk over the acres of flooring devoted to the exhibits. The exhibitions are well worth miles of travel to see, and at this time, when railroad fares are so greatly reduced, every part of the country is favored, and an opportunity is afforded to many to examine an industrial collection of rare merit and great extent.

THE LATE M. DEVILLE.

On the 1st of July the cable announced the death of one of the leading French chemists, Etienne Henri Sainte-Claire Deville. The great crime which threw our country into gloom and sadness on the following day caused less to be

said and thought about the dead *savant* than would otherwise have been the case.

Sainte-Claire Deville was born on the island of St. Thomas, in the Antilles, March 11, 1818, of Creole origin. At an early age he was sent to Paris to study, and after a serious debate as to whether to devote himself to science or music, he chose the former, and began work under the guidance of Dumas. The results of his investigations were so fertile that he soon received a call to the chair of chemistry in the scientific Faculty of Besançon, at the early age of twenty-six. Here he devoted himself to the analyses of the mineral waters of that section, and introduced some improvements into that branch. He had previously made a careful study of turpentine and the terpenes, and in 1842 discovered toluol. One of his most remarkable discoveries, from its bearing upon theoretical chemistry, was that of anhydrous nitric acid in 1849. This was the first of the monobasic acids that had ever been obtained free from water.

From a practical stand-point his researches upon aluminium and platinum are the most important. Under the patronage of Napoleon III., who furnished him with unlimited means, he attempted the manufacture of aluminium on a large scale, and at the Paris exhibition of 1855 he displayed massive bars of this hitherto unknown metal. The methods devised and employed by him are still in use in the few factories where this metal is made. The use of sodium in its manufacture created a demand which resulted in lowering its price from $400 to $3 per kilo. within ten years.

Another new industry started by Deville, aided by Caron, was the manufacture of magnesium, the production of which has reached ten tons annually.

In conjunction with Debray, Deville took up the study of the platinum metals. To produce the necessary heat he modified and improved the oxyhydrogen blow-pipe, and afterwards applied its intense heat to other purposes, among which we may mention the production of crystallized minerals, zircons, periclase, willemite, and stanrolite. He also determined the vapor density of the chlorides of iron and aluminium, upon which depend the formulas and molecular weights of these compounds.

When France decided to prepare a normal international meter measure, which should be made of platinum alloyed with iridium, it was but natural that she should turn to Deville for assistance in casting so large an ingot of the refractory metals. Under his direction it was successfully accomplished. At the conclusion of this labor, Deville presented to the French Academy a tight bottle containing fifteen pounds of osmium, with the remark that twenty pounds of this metal would suffice to poison the entire population of the earth.

Among other useful discoveries made by this chemist we must not forget to mention a process for the manufacture of oxygen gas on a large scale, by passing alternate currents of air and steam over heated alkaline manganates and permanganates.

Among so many important contributions to knowledge it would seem difficult to select one as his crowning achievement, yet we can scarcely hesitate to assign this place to his discovery of the laws of dissociation, which he published in 1857.

Sainte-Claire Deville was a man of rare personal qualities; he was devoted to his pupils, by whom he was greatly beloved, and we can do him no higher honor than to quote the words of Dr. Norton, who calls him the Bunsen of France.

THE AMERICAN ASSOCIATION.

The American Association for the Advancement of Science held its annual meeting in August, at Cincinnati. The meeting was largely attended, and as usual a great number of new members were added.

The papers read before the Association presented the usual diversity, not only in the subjects treated of, but also in their intrinsic value.

Professor Carmichael exhibited his new radiometer, which consists of two glass bulbs covered with lamp-black upon the ends of a glass tube filled with alcohol, and accurately balanced upon a knife blade. In the sunlight the beam moves up and down like a steamboat walking-beam.

Professor Atwater read a valuable paper upon "The Chemistry of Fish and Invertebrates." We regret that lack of space prevents a full abstract of it. The author stated that 100 pounds of flounder, as found in the markets, contained only 5 pounds of solids, the same weight of lobster 8 pounds, haddock 9 pounds, blue-fish 11, cod 12, shad 16, salmon 27. The flesh of fish, oysters, etc., is not only more watery, but also contains less fats, than ordinary meats. Fish, he said, is no richer in phosphorus than other animal foods.

Professor C. Gilbert Wheeler detailed his experiments upon maize residue from the manufacture of glucose. He believes it to be a highly nutritive fodder, since it contains 5 per cent. of fat, 9 of albuminoids, 2½ of fibre, and 41 of water, when moist.

A new material for stopcocks and stoppers was described by Professor H. W. Wiley. It is made of graphite 5 parts, rubber one part, and sulphur ¼ part. Stoppers made of this material are unaffected by acids, alkalies, or bromine, and never get fast like glass stoppers. It is called, after its inventor, Mayall metal.

The same gentleman read a paper on mixed or "new process" sugar, and described a method of estimating the constituents, which was essentially the same as that given in the September number of the Journal. In different samples of mixed sugars analyzed by the author, he had found about 26 per cent. of grape sugar (amylose) and 70 of cane sugar.

The next meeting is to be held in Montreal, August 23, 1882. Professor J. W. Dawson was elected president, and Professor W. Harkness first vice-president. Professor H. Carrington Bolton was elected vice-president, and chairman of the section on chemistry.

The proceedings were varied by excursions to different points of interest in the vicinity.

Mr. Sargent, director of the botanic garden and arboretum of Harvard College, calculates that there are 200,000 acres of unimproved land in Massachusetts which could at once be covered with larch plantations with advantage, and that if so planted their net yield in fifty years would be considerably more than $1,000,000,000.

METEOROLOGY FOR AUGUST, 1881.

The sum of my observations on the weather for the past month has been as follows: —

Average Thermometer.		Lowest.	Highest.	Range.
At 7 A. M.	66.10°	55°	75°	20°
At 2 P. M.	77.19°	60°	88°	28°
At 9 P. M.	68.16°	60°	76°	16°
Whole month	70.48°	55°	88°	33°
Last 13 Augusts	68.32°	62.79° in 1866.	71.76° in 1872.	8.97°
3 summer months	67.19°	41°	88°	47°
Last 13 summers	68.55°	65.60° in 1867.	71.81° in 1876.	6.21°

The average barometer for the past month was 29.972 inches, the lowest 29.61, and the highest 30.20, a range of .49 of an inch. The sum of the daily variations was 2.90 inches, giving an average daily movement of .093 of an inch. The average for the last nine Augusts has been 29.954, the lowest 29.868 in 1878, and the highest 30.010 in 1880, a range of .142 of an inch, and showing August to be above the yearly average, 29.919.

The face of the sky in 93 observations gave 55 fair, 18 cloudy, 16 overcast, and only 4 rainy. The amount of rain was only .87 of an inch, the smallest amount during the last thirteen Augusts. The average has been 4.335 inches, the lowest as given above, and the highest 10.03 in 1872, a range of 9.16 inches.

The direction of the wind gave an excess of 17 southerly and 50 westerly observations over the northerly and easterly, indicating the average direction, approximately, to be west 18° 45′ south, or nearly W. S. W. The average direction of the August winds for the past thirteen years has been west 23° 45′ south. In only two instances has the northerly wind prevailed over the southerly, namely, in 1869 and 1873; and in two instances have the easterly prevailed over the westerly, namely, in 1873 and 1875.

The past August has been distinguished for the very small amount of rain, and also for its great heat, being nearly two degrees above the average for the past eighteen years. These extremes combined to produce quite a drought, injurious to many of the fall crops.

D. W.

Natick, *September* 7, 1881.

EDITORIAL NOTES.

Glucose in Honey. — We find the following item going the rounds of the English and American journals: —

According to *Les Mondes* of February 24th, the presence of glucose in honey may be detected by mixing a solution of twenty parts of honey in sixty parts of water with alcohol. If glucose is present there will be a heavy precipitate of dextrine, while if the honey is genuine the mixture merely becomes milky.

With all due respect for our Paris contemporary, we must object to the test as liable to mislead. Dextrine is necessarily present in all glucose syrups, but it is not precipitated by alcohol except from very concentrated solutions, and might easily escape detection by the test mentioned.

Amylose. — *Science* proposes, at the suggestion of Professor Wiley, that the name *amylose* (Latin *amylum*, starch) be applied to the various kinds of syrups and sugars manufactured from starch, and now known as glucose, dextrose, grape sugar, and starch sugar. We second the proposition, and hope to see the new word take its place at once in technical and saccharine literature.

The Cotton Exposition. — Atlanta is showing an enterprising spirit, hitherto rarely met with in the

South, by inaugurating an International Cotton Exposition. Excursion tickets will be sold from Boston to Atlanta and return, good for thirty days, at the reduced price of $44. November and December are the best months in the year to visit Atlanta, and from our personal knowledge of the people there we do not doubt that visitors will meet with a hearty reception. Our medical friends will also be interested in visiting the Southern Medical College, examining its unique collections, and listening to its facetious president, Dr. T. S. Powell.

BARBARISMS. — The inventor of the *ear-phone* takes offence at our calling that name barbarous. According to Webster, a *barbarism* is an "offence against purity of style or language." While we have no wish to disparage his useful invention, which is making lighter the hard lot of many who are "hard of hearing," we must earnestly protest against the introduction of hybrid compound words, made up, as ear-phone is, of Greek and English. Had the inventor chosen the term *otophone*, in analogy to *otology*, we should not object to its use. There are many other words, equally barbarous, that are trying to creep into our language. Take the popular term *intype* as contrasted with the more correct name of ferrotype; it is an offence to the ear and the sense, since no tin enters into its composition. The word *cablegram* has been suggested for a message by cable, but it is nearly as bad as ear-phone, the only excuse in its favor being that the Greeks had no word for cable. Of course a paper that inserts "phunny-graphs" intends to be funny, and violates all rules of syntax and orthography, but the term copygraph as applied to the hectograph is an unpardonable barbarism. How would "shortography" sound in place of stenography, or "littlescope" for microscope?

PHYSIOLOGICAL MAGNETISM. — M. Ziegler, of Geneva, in a paper recently read before the French Association for the Advancement of Science, states that he has discovered that two magnetized bars of metal, joined together in a certain manner, produce certain definite effects upon animals submitted to experimentation, which differ according to the angle of intersection. One of these bars can be replaced by terrestrial magnetism. It is concluded that terrestrial magnetism radiates in the same way as light or heat, and that its rays are refracted in passing through certain bodies, such as crystals and iron. The physiological effect of magnetism can be shown by concentrating its rays through a lens of soft iron on the heart of a rabbit, when circulatory disturbances will occur. Violent peristaltic movements are provoked by focussing in the same way the magnetic rays on the intestines. M. Carl Vogt, who read the paper, states that he has himself observed the effects produced on the bowels, and, without giving any theoretical explanation of their mechanism, he believes that the discovery will lead to important results in physics, physiology, and medicine.

SALT WATER FOR LONDON. — The *Sanitary Record* says: "All opposition has been withdrawn to the bill authorizing the construction, by a company, of conduits from Lancing, on the Sussex coast, to London, for supplying the metropolis and the intervening districts with sea-water. It may be presumed, therefore, that this useful project will be carried into effect. The period allowed by the bill for the completion of the undertaking is seven years. The principal metropolitan termini of the pipes will be at St. John's Hill, Battersea; Maclise Road, Hammersmith; and Victoria Street, Westminster. The maximum rate to be charged for the sea-water to the owners or occupiers of private houses connecting with the company's mains will be ten shillings per thousand gallons."

A DUTCH S. P. C. A. — That pleasant French traveller, Henri Havard, tells us that on his first visit to Holland he used to see quite often the heavy barges called *trekschniten* dragged along the canal by a big dog and a woman, harnessed to the same rope, while the man steered. On a later voyage he missed the big dogs, and saw only the woman, or perhaps two women, tugging at the heavy boat. Informing himself as to why this change in the habits of so conservative a race as the Dutch, he learned that the local Society for the Prevention of Cruelty to Animals had secured the passage of an act prohibiting the harnessing of dogs; so the women had to do it all themselves!

WHAT IS LIME-WATER? — A druggist in London has recently been fined *five pounds* for selling lime and water instead of lime-water. The compound sold was found to contain but half as much lime as is required for saturation; hence the action. Two others, who, the town clerk said, were "on all fours" with the defendant, were fined the same amount. Our British friends believe in a stringent enforcement of the law.

THE GERM IN FLOUR. — Since the introduction into milling of a machine for splitting the grain and removing the germ, the question has been raised as to whether the flour is injured thereby. The *American Miller* says that the germ is not a proper ingredient in flour. Its oily nature is well known, and it can readily be proved that its tendency when incorporated in the flour is to make the bread heavy; and heavy bread is neither palatable nor digestible. A very careful scientist, Professor Graham, has conclusively proved that the popular taste for white flour and light bread is a perfectly rational one, and is based on scientific facts. Both the bran and the germ injure the bread-making qualities of flour, and Professor Graham would justify their removal on these grounds alone, conceiving a scientific flour to be one from which every particle of bran and germ was extracted. This is just the kind of flour that our advanced millers are attempting to make; and in catering to the public taste for white flour they are also making, in removing the germ, a flour which science says is the most suitable for human food.

A NEW SOURCE OF SELENIUM. — The only substance that can be employed in the photophone and for photo-electric experiments is selenium, which is exceedingly rare. It is therefore interesting to know that a new source of this element has been discovered. According to *Les Mondes*, an ore containing twenty-eight per cent. of selenium has been found at Cachenta, in the province of Mendoza, in the Argentine Republic. It is said to be associated with silver, copper, lead, iron, tellurium, and sulphur.

IS IT SO? — A foreign scientific journal remarks, as a curious physiological fact, that although open-air life is so favorable to health, yet it has the apparent effect of stunting the growth in early youth. Thus, while the children of well-to-do parents, carefully housed and tended, are found to be taller for their age than the children of the poor, they are not so strong in after years; the laborer's children, for instance, who play in the lonely country roads and fields all day, whose parents lock their humble doors when leaving for work in the morning, so that their offspring shall not gain entrance and do mischief, are almost invariably short for their age; the children of working farmers exhibit the same peculiarity. After sixteen or eighteen — after years of hesitation, as it were — the lads shoot up, and become great, hulking, broad fellows, possessed of immense strength. According to these statements, it would seem that in-door life forces the growth at the wrong period, and thus injures. Is it so?

A CURIOUS SPECIFIC FOR CONSUMPTION. — A well-dressed and apparently intelligent woman appeared at the dog-pound in New York the other day, and asked for the forequarter of a dog that had been drowned. She said that her sister had consumption, and that some one had told her that the forequarter of a drowned dog made into a stew would cure the disease. She got the meat, and went away contented.

ATOMS.

CALIFORNIA has been in American possession but thirty four years, and its exports and imports are this year more than twice as great as those of the twenty-seven States and two Territories which compose the Mexican republic, though California's population is less than one twelfth and its area not more than one fifth of hers. — The *Philadelphia Reporter*, referring to the statement by Dr. Heurot, of Paris, that he has found flogging and spanking admirable remedies in certain cases of hysterical spasm, says: "We recollect that, as a small boy, we took some doses of this same preparation for certain emotional diseases, such as slight kleptomania (toward apples), acute ira, and disorder of the organs of speech (prophania): in these and similar disorders, we join in giving it our fullest recommendation." — M. Fleischen has made a comparison between the bark of young oaks grown respectively upon sandy loams, upon peaty soils that had been once burned, and upon a similar soil that had thrice been burned, and found the proportion of tannin highest in the product of peaty soils. — A piece of zinc placed on the live coals in a hot stove will effectually clean out a stove-pipe, the vapors produced carrying off soot by chemical decomposition. — The horn of a rhinoceros, when cut through the middle, is said to exhibit on each side the rude figure of a man, the outlines being marked by small white strokes. — Platinum is stated in the books to have the atomic weight 197.2; but Herr Seubert, after much research, concludes that its atomic weight is 194.46. — The actual gold yield of California since its discovery in 1848 is a matter that can never be ascertained; but it is of record that the amount deposited in the mint up to 1880 was over $900,000,000. — A French inventor has patented an application of the electric light to the bleaching of textiles and other substances. — Professor Charcot, the eminent Paris neurologist, is said to have been paid $10,000 for a consultation in St. Petersburg.

LITERARY NOTES.

WE are frequently asked to recommend a text-book on analytical chemistry, and we take pleasure in saying that one of the most convenient and reliable works on *Quantitative Analysis* is that prepared by the late F. A. Cairns, A. M., and recently published by Henry Holt & Co. Mr. Cairns was for many years a teacher of this branch of chemistry in Columbia College, School of Mines. The methods are those found to give the best practical results, especially in the commercial analyses of ores, waters, milk, and technical products. It is thoroughly practical, and exactly adapted to the wants of the American student. It has been adopted as a text-book in several of our larger scientific schools.

Trance and Trancoidal States in the Lower Animals is the title of a pamphlet by George M. Beard, M. D., being a reprint from the Journal of Comparative Medicine and Surgery.

We learn that the second part of the third supplement of *Watt's Dictionary of Chemistry* has recently been published by the Longmans, London. Those who have the remainder of the work will be anxious to obtain this supplement.

The Sugar Beet is the title of a new paper, published monthly by H. C. Baird & Co., Philadelphia, at 50 cents per annum. It is edited by Dr. Robert Grimshaw and L. S. Ware, M. E.

The Rocky Mountain Medical Review is the title of a beautifully printed journal, full of new and interesting matter, which comes to us from Denver, Col.

We have just received the *Report of the Commissioner of Education* for 1879. It contains, beside statistics, a large amount of valuable information regarding all branches of education, both at home and abroad. From it we learn that the total number of colleges in the United States is 364, with 4241 instructors and 60,011 students. The number of degrees conferred in 1879 was over ten thousand.

We are indebted to P. W. Sheafer, of Pottsville, Pa., for his paper on the *Geology of Schuylkill County*.

Le Génie Moderne is the title of a weekly paper published in Paris as the special organ of industrial and artistic exhibitions. It is needless to say that at present it is chiefly devoted to the electrical exhibition in the Palais de l'Industrie.

Medicine and Pharmacy.

THE CARLSBAD SPRING.

A WRITER in a recent number of the *Continental Times*, of Geneva, gives a lively description of the famous Spa of Carlsbad in Bohemia, the following extracts from which will doubtless both interest and amuse our readers: —

The royal free town of Carlsbad, at present crowded to excess by a cosmopolitan gathering of real or imaginary valetudinarians, is situate on one of the most malodorous little rivers in Christendom, — the Tepl, — and, when approached by road from Marienbad, may be said properly to commence at a light suspension bridge spanning that offensive stream between two prettily laid-out promenades, dedicated to the recreation and rest of those whom congested liver, gout, rheumatism, and other painful human ailments have condemned to absorb a certain quantity of Dame Nature's vilest brews in the Bohemian headquarters of medicinal waters. Carlsbad, as a town, is not particularly picturesque, — a long, straggling collection of green and white houses, built terrace-wise on steepish hill-sides flanking the dirty Tepl. . . . On the right bank of the river is situate the renowned hot-spring, commonly known by the name of Sprudel, and said to be unique of its kind. . . . Nearly opposite the massive oaken basin through which the Sprudel spouts, gushes, and steams incessantly, day and night, frowns, from the opposite side of the river, the enormous rock to which, if the pet legend of Carlsbad be founded upon fact, the famous spring in some degree owes the original discovery of its healing virtues.

About the middle of the twelfth century, Kaiser Karl IV., who was passionately addicted to field sports, happened one day to be "a chasing of the wild deer and following of the roe" in the highlands adjacent to the valley of the Tepl. His hounds, a goodly pack, ran a stag of ten to such desperate straits that the hard-beset monarch of the glen leapt, from a projecting point of the mountain ridge overhanging the river, down a precipice into the stream itself, some four hundred feet below. He must either have jumped very far out or have found strength to drag his broken limbs some distance from the spot upon which he fell; for the imperial dogs, which scrambled down the hill-side after him, found his body half boiled in a seething spring, and burnt their noses dreadfully in spirited but futile attempts to tackle the carcass. Attracted by their piteous howlings, His Apostolic Majesty hurried down to the already-cooked deer; and when he saw what had happened to his game, very naturally flew into a terrible passion, — for venison boiled (especially in strong mineral water) is venison spoiled. As soon, however, as he had surmounted his first pangs of disappointment and anger, being a monarch who always had a keen eye for the main chance, he began to reflect that the plentiful upspringing of hot fluid from the earth's bowels was a phenomenon of rare occurrence, possibly to be turned to some good and profitable account. So he ordered his body-surgeon, one Father Bayer, to investigate and report to him upon the nature and attributes of the steaming source. That reverend leech analyzed the water according to his lights, and pronounced it to be possessed of extraordinary hygienic properties. Kaiser Karl, happening just then to suffer acutely from an affection of the right hip-joint, very pluckily (considering the prejudices and superstitions of the age he lived in) used the Sprudel freely, at his doctor's recommendation, and derived such wonderful benefit from it that he ordered a commemorative castle to be built on, and a small town at the foot of, the rock from which the despairing stag had taken a header in the extremity of its fear and anguish. The rock is still called "The Deer's Leap" (Hirschensprung); but the castle, erected A. D. 1364, has long since crumbled into dust and utterly vanished. Carlsbad, however, remains and is prosperous. Not unmindful of its antlered founder, it has set up the figure of a stag on a natural rock-pillar near the summit of the Hirschensprung, from which one may take in the whole of the town and Tepl valley at a single view. Peter the Great climbed to this lofty point; and his visit is commemorated by a square stone block upon which is engraven a Latin inscription in letters of gold.

The most curious and interesting sight in Carlsbad is unquestionably the Sprudel. Its water, of a pale yellowish color, literally boils as it issues from the ground. When a short distance off, you cannot distinguish the jet itself for the dense cloud of steam gathered around and above it. It will cook anything for you *sur place*, from an egg to an elephant. The height to which the jet usually rises varies between two and four feet, but you will do wisely not to stand too near it, for every now and anon, as though subject to intermittent spasms of fury, it bursts up, in a thick column of seething liquid, to twice its customary altitude, scattering boiling splashes far over the brink of its oaken basin. It tastes like weak chicken broth into which a bundle of old-fashioned lucifer-matches has been accidentally dropped and left to soak. Amongst other startling properties, it possesses that of petrification. Any object immersed in it for a short time will be completely covered by a thin hard coating of a greenish tinge, very pretty to look at, but unpleasant to think of in connection with your mucous membrane. Its capacities in this particular line of business are so powerful that if you chance to fall asleep after "filling up" with Sprudel, and before you have digested it, it will turn your inside into stone with a promptitude worthy of a better cause. Consequently, it behooves persons of somniferous proclivities to be somewhat particular about keeping their eyes open whilst they are going through a treatment of Sprudel, seeing that a casual snooze may result in imparting to them a statuesque character that is wholly incompatible with the attainment of extreme old age, — though not so, from a memorial point of view, with immortality. To awaken from a refreshing nap and find one's self converted into a monument is not altogether an agreeable surprise. . . .

The Sprudel treatment lasts from four to six weeks, during which period you may not sleep to any appreciable extent, may not eat or drink anything that you like, must get up with the worm and go to bed with the lark, are constrained upon pain of petrifaction to walk about when you would give the world to sit still; and, for all this mortification of the flesh and vexation of the spirit, find yourself called upon to expend a sum *per diem* for which, in Paris or Vienna, you could positively wallow in the good things of this life, and steep yourself to the bone in mundane pleasures. I forgot to mention that Carlsbad is deadly dull, even to a robust and cheerful human being. That is so, however. Upon invalids it exercises a truly crushing influence. I have seen men of notorious valor, arrived at about the middle period of a Sprudel "cure," cry like whipped children over the unutterable dismalness of their lot. Remember, such a man must rise at four o'clock of the morning; must not play cards, dance, or indulge in any amusement of an exciting description; must not go to sleep during the day, after his one poor, skimping, mawkish meal, lest he never wake again! Picture to yourself this luckless wretch, robbed nightly of his repose, drenched with thick warm water, half starved, bored to death, and forbidden to nod over his post-prandial cigar under penalty of transmogrification into a mere "monumental mockery" of himself! Health is a paramount blessing; but I am not so certain that it is not dearly purchased at the price of such ingenious torture as this, to be endured every day and all day for at least a month.

GYMNASTICS WITHOUT APPARATUS.

THE following, which we find uncredited in an exchange, contains some sensible and practical suggestions concerning home gymnastics without apparatus, and is well worthy of the attention of our readers: —

A great objection to the usual exercises in the gymnasiums is that the chief desire seems to be to outdo everybody else, and only those who are specially well endowed with muscular power make any show at all.

We like what are called "free gymnastics," or a series of exercises without dumb-bells, clubs, or other apparatus. In this method persons are not obliged to overwork. To practice this let the person stand erect, fill the lungs, and strike out first one arm and then the other, then both, then advance one foot and strike out with one hand and then the other, and thus take exercise with the shoulders, arms, back, and legs. Persons can thus take abundant exercise and bring themselves to a state of perspiration, and at the same time incur no danger of a strain. In these methods the action of the muscles is harmonious, and may be vigorous or gentle, and always useful; besides, it costs nothing in the way of apparatus or tuition, and can be taken every night and morning and at midday by teachers, students, clerks, literary men, and all girls and women.

A series of such exercises every day would tend to build up the muscular system better than taking irregular exercise at a gymnasium once or twice a week, where one is very apt to be led to over-exercise. When a person is half dressed in the morning, or half undressed at night, he can take exercise that will make the blood fairly tingle in the extremities, relieving the brain and vital organs, especially the digestive organs, and thus promote sleep at night, and growth and vigor during the day.

CUTTING A THIRD SET OF TEETH.

PROFESSOR OWEN, in the July number of the *Journal of the British Dental Association*, says: —

Teeth are organs that, as a rule, have a term of existence more limited than that of the organism of which they form part. In many of the lower vertebrates they are shed very soon after they are completed and in use, and are as quickly replaced by others. In the mammalia, however, there is but one succession of teeth naturally shed, but though the successors of the so-called "milk-teeth" last long enough to acquire the title of "permanent," they are rarely retained to a very advanced age. There is, however, a belief entertained by many of the occasional acquisition of a third set in human centenarians. Thus it is recorded of the Countess of Desmond, in "Fynes Morison's Itinerary" (1617), that not many years before her death, which is said to have occurred at the age of 140 years, "she had all her teeth renewed." I was led into a discussion on this point by a worthy clergyman at the house of a friend whom I was visiting, and to my skepticism as to the alleged age and third set of teeth of the old countess, he replied that there then lived in his parish an old woman alleged to have passed her hundredth year, who was actually then cutting her third set of teeth. I rejoiced at this instance. I had long been convinced that actual phenomena had suggested the statement, but that the nature of these had been misinterpreted, and I

deemed myself most fortunate in having an opportunity of testing the matter. The following morning I was driven to the old woman's cabin. It was in the north of Ireland, and she was sitting crouching over her peat fire, a typical example of human decay. To the shouts of her pastor the deaf old crone replied by pulling down her skinny lip and exposing the side of her lower jaw, from which there projected through the gum the blackened stump of a tooth, the crown of which had gone many years before. The absorption of the gums, consequent on the edentulous state of the jaw in senility, had brought to light this remnant of a long lost tooth. Other stumps of teeth, of which the loss of the decayed crown had been forgotten, might, in like manner, appear through the shrinkage and absorption of the senile jaw. And this I take to be the true ground of the allegations as to the acquisition in extreme old age of a third set of veritable teeth.

ALCOHOL IN DIPHTHERIA.

Dr. F. C. Roberts, of Fort Madison, Iowa, sends the following note to *Gaillard's Medical Journal*: —

While cauterizing a patient's throat the "victim" coughed, throwing the diphtheritic membrane all over my face. After a few days I fell ill with the disease, and suffered severely.

I used the ordinary routine of treatment, but became gradually weaker. The membrane in my throat nearly suffocated me. At last, becoming very weak, I sent for some whiskey to use as a stimulant. A drink of it nearly suffocated me, and I strangled badly, and, coughing hard, ejected a large quantity of membrane in an almost cooked condition. Immediate relief followed, and in a short time I again used the whiskey, this time as a gargle, and the sensation of ease and comfort following induced me to use it frequently, and in a few days I was completely cured.

The second case was as follows: I was called in consultation with Dr. Hoffmeister: found the patient, a boy of fourteen years, suffering much the same as I had been, only much weaker and nearly black in the face from suffocation. Remembering my own experience, I advised the use of stimulants internally and the following gargle: —

Potassæ chloratis	ʒss.
Alcohol,	
Aq. rosæ	āā ʒij. M.

Ft. gargle. Sig. To be used every half hour.

Immediate improvement followed. Since that time I have used the alcohol very freely in diphtheritic cases, and always with the most favorable results.

ANTISEPTIC INHALATIONS IN PULMONARY PHTHISIS.

According to the *British Medical Journal*, Dr. Sinclair Coghill, after many trials of the various antiseptics which have been from time to time recommended, finds that carbolic acid, creasote, and iodine, in combination with sulphuric ether and rectified spirits of wine, are the most efficacious and satisfactory. Of these three antiseptic agents iodine is the most serviceable in the second stage of phthisis, when the expectoration is passing from the glairy into the purulent character. Dr. Coghill uses a tincture for inhaling purposes, made with sulphuric ether instead of spirits of wine; and this ethereal solution has a singularly soothing effect on the cough and pulmonary irritation. In combination also with the carbolic acid as carbolized iodine, or iodide phenol, it is extremely useful in the purulent expectoration accompanying the resolution of pneumonia, both catarrhal and croupous. In the stage of excavation, whether tubercular or pneumonic, the combination of iodine with carbolic acid and creasote is most potent. The acid seems to have the greater influence in checking the amount and purulent nature of the sputa, whilst creasote acts more as a sedative in the cough, apparently by reducing the irritability of the pulmonary tissues. The addition of varying proportions of sulphuric ether and chloroform greatly assists in soothing and allaying irritation. These combinations also frequently act like a charm in the profuse expectoration of purulent bronchitis, as also in bronchial asthma. Patients, while using this form of inhalation, frequently experience great relief from the aches and flying muscular pains which often occasion much distress in the advanced stages of phthisis. The following formula may be taken as an adaptable basis for the antiseptic solution for inhaling: —

Tinct. iodi ethereális,	
Acidi carbolici	āā ʒ ij.
Creasoti vel thymoli	ʒ i.
Spir. vini recti ad	℥ i. M.

Where cough is urgent or the breathing embarrassed, chloroform or sulphuric ether may be added at discretion.

PREPARATION OF PEPTONES OR DIGESTED FOOD.

The use of peptones (digested food) in many cases of debility of the digestive organs is increasing. The usual method of preparation is to digest a kilogram of lean beef deprived of fatty and fibrous matter, and finely minced, for twelve hours at a temperature of 50° C. in 10 liters of water, acidified with hydrochloric acid (4 grams HCl per liter) with frequent agitation, adding about 10 grams of pepsina porci, more or less, according to its activity. After the digestion the liquid is filtered, and should yield no precipitate to nitric acid. It is then exactly saturated by bicarbonate of soda, and either evaporated to dryness or to a syrupy consistence. The kilogram of beef should yield about 250 grams of dry peptone, or the fluid should contain about 50 per cent. of peptone. Peptones thus prepared always contain a considerable proportion of chloride of sodium, and thus, if taken in wine, syrups, or elixirs impart a disagreeable salt taste. To obviate this, M. Petit suggests the substitution of tartaric for hydrochloric acid, using 15 grams of tartaric acid per liter of water. The digestion and filtration being completed as before, he divides the filtered liquid into two equal portions, and saturates one portion with bicarbonate of potash, and then mixes again the two portions. Cream of tartar is thus formed, and is partially precipitated at once. After another filtration the liquid is evaporated, in which process nearly all the cream of tartar is separated out in a crystalline state. The small proportion remaining does not affect the taste of wines, etc., to which the peptone may be added. A peptone wine may be made by dissolving five parts of peptone in ninety-five parts of Malaga wine. A peptone syrup is prepared by dissolving five parts of peptone in ninety parts of simple syrup, and adding five parts of tincture of orange peel.

THERAPEUTICAL HINTS.

Sassafras Oil in Rhus Poisoning. — A writer in *New Remedies* says: Allow me to suggest the free use of oil of sassafras in these cases. I have used it for years, and have never been disappointed in a *single instance*. The following is my prescription: —

Sweet oil (fresh cream is better)	℥ i.
Oil sassafras	gtt xv. M.

S. Anoint the face, hands, and all affected parts well three or four times a day.

If the bowels are constipated, or there are febrile symptoms, give sulphate of magnesia as a laxative. Try it, and you will be satisfied with the results in the most aggravated case.

Hamamelis Virginica as a Local Application. — After an extended trial of "hazelin," an extract of *Hamamelis Virginica*, Mr. Netherclift states, in the *British Medical Journal*, that he has never met with its equal as a local application to irritable and inflamed piles situated where the remedy can be easily applied. In most of the cases submitted to treatment the relief was immediate and permanent. The plan adopted by Mr. Netherclift has been to have the part bathed in the solution three or four times a day, whilst a piece of lint dipped in it was kept applied to the anus during the intervals. All urgent symptoms, as a rule, passed away in from twelve to twenty-four hours. In chronic and intractable ulcers of the varicose or eczematous description, excellent results have been afforded by using the hazelin after the fashion of a water-dressing.

Elixir of Salicylic Acid. — Dr. Wolff, according to the *Journal of Pharmacy*, gives the following formula: —

Dissolve salicylic acid, 3i. in alcohol, f. 3 vi., and add simple elixir (or elixir curacoa), q. s., f ℥ vi. The dose is a tablespoonful, containing five grains of salicylic acid, the taste of which is well masked. The elixir should not be given with water. The additional amount of alcohol in this preparation is not contraindicated, but seems to overcome the tendency of the salicylic acid to act as a cardiac depressor. In variola this elixir has been used with good results.

Anthrax Cured by the Interstitial Injection of Carbolic Acid. — In a Spanish medical journal, Dr. Muñoz publishes two cases of anthrax cured by the interstitial injection of carbolic acid. The first case was a man thirty-one years of age, of sanguine temperament and good constitution. In the upper part of the right hypochondrium he had an anthrax about the size of half an orange. Injections into the base of the tumor were practised with the following solution: —

Carbolic acid	5 grms.
Alcohol	10 "
Aqua dest.	100 "

After each injection (directed toward the centre of the tumor) compresses moistened with the same solution were applied. The pain diminished rapidly, and finally disappeared; the tumor decreased in size, and the temperature fell. Double injections were practised mornings and evenings for eight days, when complete cure resulted.

The second patient was a man aged forty-four years, of sanguine temperament and strong constitution. An anthrax of the size of a hen's egg appeared upon the postero-lateral aspect of the neck. The above treatment was followed out, and a cure resulted in a few days.

Ammonium Bromide for Whooping-Cough. — Dr. Kormann recommends the use of this salt for the relief of the cough. Dose for infants two and a quarter grains, for older children four to six grains, every two hours. If it is thrown up, repeat after the paroxysm is over. It is not to be used when persistent diarrhœa is also present.

In Anorexia. — M. Huchard recommends the following stomachic for persons who suffer from debility, with loss of appetite: —

Tinct. cardamomi comp.	f ʒ i.
Tinct. anisi	f ʒ i.
Tinct. aurantii corticis,	
Tinct. gentianæ,	
Aquæ menth. pip.	āā f ℥ iiss.
Aquæ	ad ʒ fi. M.

Sig. Teaspoonful between meals.

Abortive Treatment of Erysipelas. — In the *Archives of Dermatology*, Dr. L. Heppel makes known a new abortive treatment of erysipelas, which he has so far found to be successful in seven cases. It consists in "brushing the boundary line, and the parts extending a finger's width on either side of it,

with a ten per cent. alcoholic solution of carbolic acid, until the integument thus painted shows a decided discoloration." An agreeable sensation is said to be experienced at the points of application.

NEW USES OF SALICYLIC ACID. — Dr. George Kemp, in the *British Medical Journal*, says that salicylic acid may be used beneficially as a counter-irritant in superficial rheumatism. Thirty grains of the acid in an ounce of any suitable unguent has been found to alleviate local pain to a remarkable degree. Its advantage is greatly enhanced by the addition of iodide of potassium in an equal quantity. Another use of the remedy is in the form of enema. A case of obstinate dyspepsia with fermentation, relieved only by emetics, and accompanied by constipation and scybala, was treated by enema, with thirty grains of salicylic acid and half an ounce of tartrate of potash dissolved in a pint and a half of lukewarm water. The result was remarkable; the colon was not only relieved of its scybala, but its tonicity was greatly restored, suitable general treatment being resorted to at the same time.

SILVER NITRATE FOR WORMS. — Dr. Greensword uses a solution of five grains of silver nitrate in six ounces of water for expelling worms. Dose, a teaspoonful three times a day. If continued for a long time, silver salts impart a ghastly hue to the complexion.

STRYCHNIA FOR CHLOROFORM POISONING. — The *Southern Medical Record* describes an interesting case of a woman who had taken one ounce of chloroform with suicidal intent. It was, in fact, a typical case of profound narcotic poisoning, — pulse 80 and respiration 45 per minute. Dr. Wm. P. Nicolson, of Atlanta, who was called in at this stage, when the case seemed hopeless, began the hypodermic injection of strychnia and whiskey combined with carbonate of ammonia. In ten or fifteen minutes improvement was noticed, and the next morning she was sufficiently improved to be removed to the hospital, where she entirely recovered.

COSMETIC PREPARATIONS.

THE following recipes are from good sources: —

Tan and Freckle Lotion.

Corrosive sublimate	gr. vi.
Dilute hydrochloric acid	℥i.
Water	℥iv.
Alcohol,	
Rose water, each	℥ij.
Glycerine	℥i.

Apply at night, and wash from the skin with soap in the morning.

Le Bon's Perfumed Carbolic Acid.

Carbolic acid	1 part.
Oil of lemon	3 parts.
Alcohol (36°)	100 parts.

Glycerole of Arnica.

Fluid extract arnica	10 parts.
Glycerine	20 parts.

For chapped hands, insect bites, etc.

French Cold Cream.

Quince mucilage	40 parts.
Almond soap	1 part.
Stearic acid	10 parts.
Glycerine	2 parts.

MISCELLANEA.

AUTOMATIC REGISTRATION OF BODY TEMPERATURE. — A new form of thermograph, capable of recording automatically the rise and fall of temperature of the body for a given length of time, has been recently invented by Dr. Adams, of Colorado Springs. Its principle is, causing the electric resistance of a fine powder in a tube to vary by means of pressure derived from heat. A vulcanite tube is filled with a fine powder made of plumbago, gas carbon, and silver, these contents abutting at either end against a platinum knob. One knob is attached to a hard rubber bracket, and the other (which imparts the varying pressure) to the free end of a spiral spring, constituting the thermometer proper. This spring is made of two slips of brass and steel soldered together, the brass occupying the outer side. The more expansible brass, on rise of temperature, causes the free end of the spring with its terminal knob to twist, and so exert an increasing pressure on the tube contents. An electric current is sent through the substance in the tube, entering and leaving by binding posts; and its variations with the varying pressure affect an ingenious electro-magnetic mechanism, which produces on a moving surface a sinuous line, the graphic representation of the changes of temperature. The thermometric part of the apparatus is suitably enclosed in a circular perforated German-silver case, which is secured in proper position in the armpit.

VACCINATION AND THE AMERICAN INDIANS. — When vaccination was first introduced among the Five Nations in North America, the following address was sent by them to Dr. Jenner: "Brother, our father has delivered to us the book you sent to instruct us how to use the discovery which the Great Spirit made to you, whereby the small-pox, that fatal enemy of our tribes, may be driven from the earth. We have deposited your book in the hands of the man of skill whom our great father employs to attend us when sick or wounded. We shall not fail to teach our children to speak the name of Jenner, and to thank the Great Spirit for bestowing upon him so much wisdom and so much benevolence. We send with this a belt and string of wampum, in token of our acceptance of your precious gift; and we beseech the Great Spirit to take care of you in this world and in the land of spirits."

TO DOCTORS STARTING IN PRACTICE. — The *London Medical Times and Gazette* gives the following cynical advice in reply to a correspondent: "It has been said that medical practitioners are even more indebted to new houses than are undertakers; and that when a young medical man of fair ability and pleasing manner wishes to settle down in London his wisest course is to choose some semi-fashionable district, where showy houses, with low windows and thin walls, are being run up. If the soil on which the houses are being built is clay, so much the better for the young doctor. If the level of the ground is little above that of the Thames, his prospects are yet more brilliant. He may safely marry for love, for although the fees he will receive may not seem overwhelmingly large, he will be certain of constant employment. But towards the realization of all this it is important he should secure for his own habitation an old and well-built house."

GLUCOSE IN PILLS. — A series of experiments made by Lascheid have convinced him of the superiority of glucose over all other excipients for pill masses. Vegetable powders, cinchona alkaloids, and salts are easily made into pills with glucose, and yield a satisfactory and very soluble mass. In pills of aloes, alone or with assafœtida, the soap may be replaced by glucose with advantage.

EFFECT OF DIFFERENT GASES UPON BACTERIA. — In a communication to the London Chemical Society, J. Halton describes some experiments made with bacteria. A small bottle was half filled with mercury, and the other half with an aqueous meat extract, to serve as the bacteria generator, and inverted over mercury. Different gases were admitted into the bottle. When air was admitted there was a rapid absorption of oxygen. Other gases were tried, such as hydrogen, carbonic oxide, cyanogen, nitrous oxide, nitric oxide, and coal gas. In all these, excepting cyanogen gas, the bacteria seemed to flourish.

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SOLUBLE COMPRESSED HYPODERMIC TABLETS — We have received from Messrs. JOHN WYETH & BROTHER, of Philadelphia, some beautiful samples of the minute tablets for preparing hypodermic remedies, proposed by Dr. H. Augustus Wilson The list of tablets embraces nearly twenty varieties in which morphia, or atropia, or both, are combined, in various proportions, with sulphate of soda, the latter serving merely as a neutral vehicle. The manufacturers have had the benefit of the assistance, not only of Dr. Wilson, but likewise of Prof. Bartholow in adjusting the combinations to the usual needs of practice.

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A physician in Illinois writes: —

During the past twenty years I have received a great many scientific periodicals, from weekly to semi-annual, but I could not do without the JOURNAL. I have occupied lecturers' chairs in chemistry in two of our best medical schools (at New Orleans and Louisville), and, with all the books and other publications at my command, I have found some of my most valuable information in your pages — a true *multum in parvo*.

A physician in Pennsylvania says: —

I get as much information from the JOURNAL for one dollar as I can from any other for five.

The widow of a physician in New York writes to assure us of "the very high regard" her husband had for the paper, "to which the carefully preserved and bound volumes of it in his library are witnesses."

A venerable practitioner in the same State writes as follows: —

I can't say that I shall be walking this earth when my present subscription expires, as I have got past the age usually allotted to man; but rest assured that so long as I live there will be no dissolving of partnership with the JOURNAL if I have a dollar in my pocket to pay the subscription. From the first number, its monthly greetings have always been eagerly looked for.

The following is from Alabama: —

It contains the most refreshing reading matter that I get, and it is the unanimous wish of all the members of my family old enough to read it that it may be *permanently* retained.

Boston Journal of Chemistry
AND
POPULAR SCIENCE REVIEW.

VOLUME XV. BOSTON, NOVEMBER, 1881. NUMBER 11.

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Familiar Science.

OUR SWEETS.

THE term "sweet" is applied to certain solids and liquids which possess the capability of impressing upon the nerves of taste a peculiar sensation, which is to most people, and especially to children, very agreeable. There is no body or substance which has a distinct physical or chemical property which constitutes sweetness; or, in other words, sweetness as a *thing* does not exist. All we know about it is that certain molecules of matter grouped in certain forms have the power of producing upon the moist surfaces of the mouth and tongue the agreeable sensation called sweet. The degree of sweetness is due to the manner in which the molecules are grouped, as intensity or feebleness depends upon the slightest modification in the molecular structure of a body. When the "sweet principle" of plants is spoken of, it is meant that in the sap, with water, are associated some groups of carbon, hydrogen, and oxygen, so arranged as to produce the sensation of sweetness, and by the intensity of the sensation it can be told how they are grouped. Analysis shows the structure of sweet bodies, but nothing more. So far as science is capable of explaining things, it often fails at the most interesting stage of inquiry, and this is the case with sweets. It fails to show why a lump of sugar is sweet, and a drop of vinegar or acetic acid is sour; the point where light ceases to fall upon the pathway of the investigator is that where curiosity and interest most intensely centre. *Why* bodies are sweet, sour, or bitter can never be known; the mystery belongs to that department of organic life not open to human research; it is the dark field which has no successful explorers, and is known only to the Supreme Intelligence.

The statement that the degree of sweetness in bodies is due to apparently slight modification of molecular constitution is illustrated in a comparison of the chemical structure of several allied substances. In a molecule of cane sugar we have this grouping: $C_{12}H_{22}O_{11}$; in one of glucose, $C_6H_{12}O_6$; and lactose, the sweet principle in milk, has the same constitution. This affords a view of the molecular structure of the three principal sweets, as known and distinguished, the one from the other, by the distinctive degrees of sweetness each possesses. It will be observed that there is no difference whatever in the nature of the materials or atoms of which they are composed; each is made up of carbon, hydrogen, oxygen, and nothing else. The distinction is manifestly due to the grouping of the same elements in differing proportions, or by different methods. We have in cane sugar a larger molecule, so to speak, it having nearly double the number of atoms, as compared with grape sugar, and it holds a maximum of sweetness; but if we had the power of doubling the molecule of grape sugar, it would not give us cane sugar. We do not at present possess the power of changing the molecule of grape sugar over into cane sugar; and if, in the future, some fortunate chemist discovers a method, comparatively easy and costless, he will not only immortalize his name, but realize a fortune greater than that possessed by any living capitalist. The molecule of milk sugar, so far as chemistry informs us, is constituted exactly like that of grape sugar; it has the same number of atoms of carbon, hydrogen, and oxygen, and combined after a similar plan, but the two substances are decidedly unlike. They differ not only in degree of sweetness, but also in chemical behavior and physical properties. Grape sugar is not crystallizable. Milk sugar forms microscopic crystals united in nodules: the solution of the first rotates the plane of polarization feebly towards the right, the latter decidedly.

Cane sugar, the noblest and best of all the sweets, is presented to us in the form of aggregated, well-defined crystals, permanent under all atmospheric changes, and elegant in lustre and freedom from color when well refined. It is not only the *sweetest* of the sugars, but one of the indispensable gifts of a wise Intelligence to man. It is called cane sugar because it is produced spontaneously and abundantly in the cane grown in tropical climates, but this is not its only source: the sweet juices of the beet, maple, madder root, and palm contain it in considerable quantities. Why, in the order of nature, it was necessary to sweeten our grapes and other fruits with a different kind of sugar is not clearly understood. If it had so happened that in the construction of the juice of the sugar beet one molecule of water, or the elements constituting water, had been left out, our farmers would never have almost ruined themselve financially by erecting beet-root sugar factories in New England.

While it is impossible, at the present stage of our knowledge, to make cane sugar artificially, it is quite easy to make grape sugar in vast quantities. We find it easy to make the sugar we do not specially want, but not easy to make that we so much need; and this is not a little tantalizing. In view of what science has achieved, it is by no means impossible that some day the great problem will be solved, and our sugars will come from the laboratory of the chemist rather than from the cane plantations of the tropics.

Grape sugar is what is known as *glucose*, and this delicate organic product, elaborated from the fine juices of the grape in nature, is now reproduced after the coarser methods of the chemical laboratory. It is almost or quite a pity that this new industry has sprung up and reached such proportions in our country, for it opens the door to a kind of fraud which, although not necessarily dangerous to life, is of a most reprehensible character.

There are twelve enormous glucose factories at present in the United States, and they consume every day about twenty-five thousand bushels of corn. They turn out more glucose, or grape sugar, in a year than is made from the juices of all the grapes grown in Europe, and most of it is probably as good as that made in the structure of the vine by the action of the rain and sunshine. If it is not as good, it is the fault of the manufacturers, not of the methods. This new *old* sweet is at present attracting so much attention that it deserves consideration in connection with the subject before us. At another time, glucose will be taken up and discussed after popular methods, so that a better understanding of its nature may be had by all readers.

THE PERMEABILITY OF CAST-IRON TO CARBONIC OXIDE.

THE old dispute concerning the danger to health from the use of cast-iron furnaces and stoves, on account of the alleged permeability of the heated metal to carbonic oxide and other gaseous products of combustion, has been renewed by the appearance of a paper on the subject, by Professor Ira Remsen, in a recent *Bulletin* of the National Board of Health. He reviews the experiments of former investigators, especially of St. Claire Deville and Troost, and decides that the conclusions reached by them are wrong. He first examined carefully the methods which had been used in all the earlier experiments for the detection of carbonic oxide, and he is convinced that Hempel's method is the best one now at our command for this purpose. Hempel's method, which is a modification of Vogel's blood test, consists in allowing mice to breathe the air under examination, killing the

mice, and examining the diluted blood with the spectroscope. By this method he could with certainty detect four parts of carbonic oxide in ten thousand parts of air.

The next step in his investigation was to apply the method to the examination of the air of such buildings as seemed to be the most suspicious. The air in a comparatively large number of rooms was examined. The result of the examination was that carbonic oxide was not detected in a single case, and the conclusion is justified that in rooms heated by cast-iron stoves and furnaces there is not present in the immediate vicinity of the hot-air flues as much as 0.04 per cent. of carbonic oxide.

Experiments were also made with cast-iron stoves for the purpose of determining whether carbonic oxide passes through cast-iron heated to redness or not. All these experiments gave negative results, and showed that under apparently the most favorable conditions not as much as 0.04 per cent. of carbonic oxide passes through heated cast-iron.

Whether carbonic oxide in smaller quantities than can be detected by Hempel's method is present is a question that cannot be answered; and, even if it is present, it is doubtful whether it is injurious to health. Some authorities believe 2.5 parts of carbonic oxide in 1000 of air may be regarded as harmless; while others think that even 0.25 of a part of the gas in 1000 may be prejudicial to the health of man, though not necessarily to that of other animals, the latter appearing to be less sensitive to its action.

Professor Remsen's paper has been sharply criticised in the London *Sanitary Record*. The following extracts from the review will interest our readers: —

Now Professor Remsen, having arrived at conclusions, from his own researches, which tend to throw doubt upon the accuracy of the observations of the committee appointed by the French Academy, proceeds to enumerate what he calls three good reasons for doubting that accuracy. The first of these is that the amount of carbonic oxide found by the committee, namely, 0.04 per cent. by volume in the air of the cast-iron chamber, is higher than the truth, since the committee arrived at that result by allowing for the coexistence of *marsh gas* with the carbonic oxide; whereas Professor Remsen states that other hydrocarbons, containing a larger proportion of carbon than marsh gas, are "just as likely to be present." Now that higher hydrocarbons than marsh gas result from the destructive distillation of coal is of course granted; but that they would be just as likely to traverse a heated wall of cast-iron seems rather more than doubtful. In the first place, having heavier molecules than the marsh gas, such higher hydrocarbons would have greater difficulty in forcing their way through the pores of the heated iron. Again, these higher hydrocarbons are less *stable* than marsh gas, and, even if they escaped decomposition, in the interior of the furnace would be very likely to give up a portion of their carbon to the heated iron during their passage through the wall of the furnace, becoming thereby reduced to the state of marsh gas.

The second objection raised by Professor Remsen is that *aerial organic matter* might, by being burned in the heated copper oxide tube, increase the production of carbonic acid, and thus unduly raise the computed amount of carbonic oxide in the air around the furnace. When it is remembered that the inner wall, at all events, of the chamber from which the air was aspirated into the copper oxide tube was *heated to dull redness*, it seems little probable that any appreciable quantity of organic matter in air traversing the chamber would escape conversion into carbonic acid and water. Neither does it seem probable that much organic matter would escape the tubes containing sulphuric acid and caustic potash, which the air was made to traverse before reaching the copper oxide tube.

Moreover, the third source of error pointed out by Professor Remsen, namely, the escape of a portion of carbonic acid gas from absorption by the caustic potash tubes, applies equally to the researches of Erisman, who is said to have found organic substances in the air of a room by the method of Deville and Troost. The carbonic acid, supposed by him to be due to oxidation of organic matter in the air, is just as likely to have escaped absorption by his purifying apparatus as a portion of that attributed to the oxidation of carbonic oxide by Deville and Troost is to have escaped theirs.

But there is yet another source of error in the experiments of Deville and Troost, of which no mention is made by Professor Remsen, namely, the almost impossibility of removing all the *moisture* from air by drying tubes. Now, this moisture would tend to increase the apparent production of water in the copper oxide tube, and would consequently increase the computed amount of *hydrocarbon*, and correspondingly *decrease* the estimated percentage of carbonic oxide in the air around the chamber, thus counterbalancing the possible error due to imperfect absorption of carbonic acid by the purifying apparatus.

These strictures of Professor Remsen have been dwelt upon at some length, because they do not seem to us to offer any valid evidence against the acccuracy of the work done by the French Committee.

The reviewer then takes up Professor Remsen's comments upon the methods of Vogel, Gottschalk, and other investigators, and disposes of them in much the same way; but our space does not allow us to quote these portions of the criticism. Finally, he examines the professor's own methods, and endeavors to show that they are quite as untrustworthy as he himself considers those of others to have been. We can quote but a single brief paragraph as an illustration of these strictures: —

The author and his assistant, by extreme care, were enabled to detect 0.04 per cent., exactly the amount found by the committee in the air around the furnace. Now much stress is laid upon the point that in several cases no carbonic oxide could be detected by the Vogel-Hempel method in the blood of mice, which had been placed for a time not stated in the immediate vicinity of the hot-air flues leading from various notably bad stoves. Granted that the air in these places contained less than 0.04 per cent. of carbonic oxide gas, how does this touch the report of the French Committee? The hot-air flues would hardly be red-hot, and the mice were not placed in confined chambers built around the flues.

We will add only the closing sentence of the review: —

To sum up, it seems to us that the statement of the French Committee stands unshaken by all subsequent investigations, and this important matter must still occupy a leading place in the minds of sanitarians.

It will be borne in mind that, even if we admit all that Professor Remsen claims to have proved, the danger from leaky joints and mismanaged dampers in hot-air furnaces none the less remains; and this, in most cases, is probably the more serious danger. That a cast-iron furnace cannot be made gas-tight so far as the joints are concerned, we will not assert; but that they rarely are gas-tight nobody can deny.

EXPERIMENTS FOR YOUNG CHEMISTS.

BY PROF. E. J. HALLOCK, PH. D.

II.

In our last paper we gave out the problem of finding how much potassium chlorate it will take to make a liter of oxygen weighing, at a temperature of 0°C., 1.43 grams. To answer this we first require to know the molecular weight of $KClO_3$. In all cases we can find the molecular weight of a compound by taking the sum of the atomic weights of its constituents. Thus we have: —

Potassium	39.1
Chlorine	35.5
3 Oxygen	48 0
$KClO_3$	122.6

Then, by a simple proportion, we see that $KClO_3 : O_3 :: 122.6 : 48$; hence, 122.6 grams of $KClO_3$ will make 48 grams of oxygen; and 1 gram of $KClO_3$ will make 0.391 grams of oxygen, or 273 cc. of the gas. After the oxygen has all been used the bottles may be filled up to the mark with water, and the water measured or weighed. Practically, the student will rarely get over 200 cc. of oxygen from a gram of $KClO_3$. The quantity of $KClO_3$ theoretically necessary to make a liter of oxygen is 3.65 grams.

HYDROGEN.

This gas may be made in a test tube as oxygen was, but since no heat is required a wide-mouthed bottle is preferred. Fit the bottle with a good cork, and bore two holes through it. Through one of these pass a funnel tube, and through the other a piece of glass tubing about 10 or 15 cm. in length and bent at right angles. Connect one end of the latter, by means of a piece of rubber tubing, with a second piece of glass tubing, about 30 cm. in length, and bent at an angle of 135° near each end. Weigh out 2 grams of zinc and place in the bottle, and fill it half full of water. Fill two bottle and two or three test tubes with water, and invert them in the dish which is to serve as pneumatic trough.

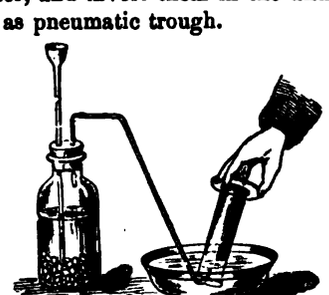

Fig. 2. Preparation of Hydrogen.

When all is in readiness, pour a little strong sulphuric acid (H_2SO_4) down the funnel tube, and a brisk effervescence will take place. After a few minutes collect a test tube full of the gas and bring it near a flame. If there is nothing but air in the test tube, it will not burn; if there is a mixture of air and hydrogen, it will produce a loud report. If it burns with a blue flame and very slight report, the hydrogen is nearly pure, and may now be collected in the bottles. Some small Christmas candles attached to wires bent like the letter J are useful in nearly every ex-

periment. On bringing a lighted candle into this gas the gas takes fire, but extinguishes the candle. In oxygen the candle burns with increased brilliancy. Note the difference which affords a test for each. After some time the longer bent tube may be removed, and a J-shaped piece of glass tubing, drawn out to a jet at the shorter end, substituted. Wrap the bottle in a towel; then carefully light this jet. Hydrogen burns with a colorless flame, but the soda of the glass usually colors it yellow. If you have a plentiful supply of oxygen at hand, place the burning jet of hydrogen in a bottle of dry oxygen. The heat will soon melt the glass and close the jet. When the hydrogen burns in a jar of dry air or of oxygen the sides of the vessel are soon covered with dew, showing the synthesis of water.

The formula for making hydrogen is as follows: $H_2SO_4 + Zn = ZnSO_4 + H_2$.

The atomic weight of Zn is 65, of sulphur 32, oxygen 16, and hydrogen 1. The molecular weight of sulphuric acid is 98.

2 Hydrogen	= 2
1 Sulphur	= 32
4 Oxygen	= 64
H_2SO_4	= 98

The molecular weight of $ZnSO_4$ is 161. At the close of the experiment pour the solution of $ZnSO_4$ from the bottle, filter it, and evaporate to dryness. The undissolved zinc is also to be dried and weighed, and its weight deducted from that first taken. The zinc consumed should be to the $ZnSO_4$ formed in the proportion of 65 to 161. If the latter is allowed to crystallize, it will take seven molecules of water, and its molecular weight is then 287, and each gram of zinc will make 4.415 grams of the crystallized sulphate.

A liter of hydrogen weighs 89 mg.; hence each gram of zinc ought to make 349 cc. of hydrogen, measured at 0° C.

Hydrogen can be made by decomposing water with sodium, but accidents often attend this simple experiment, and we advise the young chemist not to try it.

COMPOSITION OF WATER.

This may be shown both analytically and synthetically. We have seen above that water is formed by burning hydrogen in oxygen; hence it is an oxide of hydrogen. The decomposition of water by means of a battery will show the proportions in which these two elements are combined. If the student has no battery he can construct one at a small expense, by using glass preserve jars, strips of sheet zinc, porous cells made of plaster of Paris, and pieces of gas carbon.

There are several forms of apparatus in the market for decomposing water, but satisfactory results may be obtained with one made from a glass or porcelain funnel, and if the stem of the funnel is broken off it is all the better. Take two small strips of platinum foil, and fasten them to pieces of copper wire passed through a cork which will close the funnel tightly. Pour a little melted beeswax or paraffine over the cork to prevent any leakage. Fill the funnel two thirds full of water, and invert in it two test tubes, each filled with water, in such a manner that one tube shall be over each electrode. With glass tubes 25 to 40 cm. in length, sustained vertically by a suitable support, the apparatus answers equally well for a lecture-room experiment. A few drops of sulphuric acid are added to the water to make it conduct the current. In a short time it will be noticed that the gas accumulates more rapidly in one tube than in the other, and on testing this gas it is found to be hydrogen. The other gas is tested with a glowing splint, and shown to be oxygen. In a carefully conducted experiment there will be exactly twice as much hydrogen formed as oxygen, and that is why the formula of water is written H_2O.

A mixture of two volumes of hydrogen and one of oxygen may be made in a strong wide-mouthed bottle or open cylinder, and exploded by means of a candle on the end of a long stick. A loud report is heard, and, although the bottle is rarely broken, it is well to provide against accident by wrapping it in a towel.

Oxygen is called a *dyad* because it combines with two volumes of hydrogen, which is called a *monad*. Only two volumes of steam, H_2O, are formed from two volumes of H and one volume of O.

CUTTING GLASS BY HEAT.

Many directions have been given for cutting glass by the action of heat: by setting on fire a string wet with turpentine, by friction with a cord, by a hot iron, and the like. Of these the hot iron is the simplest and the best. The following directions for the method, and also for making pencils or pastils to be used in a similar way, are from the *Young Scientist:* —

The iron rod (a common poker answers very well) should be somewhat pointed, and the line along which the cut is to be made should be marked by chalk, or by pasting a thin strip of paper alongside of it; then make a file mark to commence the cut; apply the hot iron; and a crack will start, and this crack will follow the iron wherever we choose to lead it. In this way jars are easily made out of old bottles, and broken vessels of different kinds may be cut up into new forms. Flat glass may also be cut into the most intricate and elegant forms.

Sometimes it is not convenient to use a red-hot iron, and some persons fail in its use. In such cases carbon pencils or pastils may be used. They are made according to different recipes, of which we give three:—

(1.) Dissolve 100 parts of gum arabic in 240 parts of water, and mix the solution with a paste prepared by triturating 40 parts of powdered tragacanth with 640 parts of hot water. Then, having dissolved 20 parts of storax and 20 parts of benzoin in 90 parts of alcohol (0.830), strain the latter solution, and add it to the mixed mucilage. Finally mix the whole intimately with 240 to 280 parts of powdered charcoal, so as to be uniform throughout. The charcoal should previously be passed through a fine sieve. The doughy mass is cut into suitable pieces, which are rolled between two boards dusted over with coal-dust, until cylindrical strips about one centimeter in thickness are formed, which are allowed to dry slowly between blotting-paper. When using them, one end is pointed like a lead-pencil, and, after having previously made a scratch in the glass with a file or diamond, the heated and glowing end of the pencil is carried along the line in which the glass is intended to be fractured.

(2.) Dissolve 8 to 10 parts of tragacanth in about 100 parts of hot water; add to the mixture, under stirring, 30 parts of acetate of lead and 60 parts of finely-sifted beechwood charcoal, and proceed as in the previous formula.

(3.) Sticks of soft wood (willow or poplar), of about the thickness of a finger, which must be thoroughly dry, are immersed for about one week in a concentrated solution of acetate of lead, after which they are again dried. When ignited, these sticks burn like glazier's charcoal.

The first formula is that of Berzelius, and yields the best product, as it burns much slower than the others. These pastils maintain a more uniform heat than a hot iron, which is constantly getting cold.

HOUSEHOLD RECIPES.

Pain Killer. — A good article may be made as follows: —

Spirits of camphor	2 ounces.
Tincture of capsicum	1 ounce.
Tincture of guaiac	½ "
Tincture of myrrh	½ "
Alcohol	4 ounces.

For external use in bruises, sprains, etc.

For Cuts and Bruises. — One of the most convenient remedies, usually to be found in every kitchen, and which has proved of great value in hundreds of cases of cuts, scratches, bruises, and injuries inflicted by tearing the flesh on blunt instruments, rusted nails, and the like, is made by dissolving bicarbonate of soda or potash in strong cider vinegar, and applying it during the effervescence, or soon after.

To Preserve Ox-Gall. — Take one pint of fresh gall, boil, skim, and add one ounce of powdered alum, and boil until it has all been dissolved. When cool, bottle. To another pint of gall add one ounce of table salt, and cork. At the end of three months mix the two solutions.

Kerosene Liniment. — The *Druggist's Circular* publishes the following formula for kerosene liniment: —

Kerosene	2 ounces.
Tincture of opium	4 drachms.
Tincture of arnica	5 "
Tincture of stramonium	4 "
Aromatic spirits of ammonia	6 "
Spirits of camphor	5 "
Oil of origanum	4 "
Chloroform	3 "

Rub in twice a day.

Grease Eradicator. — Kilner gives the following recipe for this compound: —

Castile soap in shavings	4 ounces.
Carbonate of soda, powdered	2 "
Borax powdered	1 ounce.
Aqua ammonia	7 ounces.
Alcohol	3 "
Turpentine	2 "
Sulphuric ether	2 "

Soft water enough to make one half gallon. Boil the soap in the water until it is dissolved, and then add the other ingredients.

SCIENTIFIC BREVITIES.

A Simple Method for Obtaining Ozone. — Put a few sticks of clean phosphorus in a basin of water, half cover them with fresh cold water (soft), and put a closed bell jar or inverted glass vessel (clean) of any kind over all, so as to confine the air above the phosphorus. In the course of an hour the air thus confined will be found charged with ozone.

An Italian Antarctic Expedition. — The Italian expedition for the exploration of the Antarctic seas was to leave Genoa on the 3d of October for Buenos Ayres. Lieutenant Bove, who had been appointed commander, had completed all his preparations, and some of the professors who are to take charge of the different branches of work are at present residing in South America. The results of this expedition will be looked for with much interest, for although we know something of the Arctic regions, the Antarctic are at present comparatively unexplored, the only regular visitors being a few whaling and

seal-hunting vessels from the Atlantic ports of the United States.

To Hear the Grass Grow. — At a recent meeting of the Silesian botanists, an apparatus made by Thomas and Lügel was exhibited which permits us to measure the rapidity of the growth of a plant. The latter is connected with an index which advances visibly and constantly, and exhibits the growth on a scale fifty times magnified. If this index be connected with an electric hammer, the current of which is interrupted as the index passes over the divisions of the circle, the growth of the plant will not only be visible, but also audible to the ear; hence the phrase "to hear the grass grow" will no longer be without a literal meaning.

Practical Chemistry and the Arts.

GERMAN UNIVERSITIES.

Several years ago the writer asked a distinguished English chemist which German city offered the best facilities for the study of chemistry. He wrote out the following list, with the name of the professor at each: —

Kekulé at Bonn.
Kolbe at Leipsic.
Bunsen at Heidelberg.
Hofmann at Berlin.

These four, he said, were all so good that he could make no distinction. We have since visited each of these places, have made the acquaintance of two of the professors, and informed ourselves carefully in regard to the others. For the benefit of those who wish to study science abroad we propose to enumerate briefly the advantages of each of the four. To-day we can add to the list the names of Strasburg, Würzburg, and Göttingen as offering certain inducements, while Zürich must not be forgotten.

It would be impossible to lay down any general rule of action, or to designate any one university or laboratory as the best. Those who go abroad differ very greatly in their tastes, their preparation, and their intentions; and the length of time, too, that they can remain must be taken into account at the outset.

A few who have completed their elementary studies, and are familiar with organic and inorganic analysis, and who wish to devote their whole time to research, will need no advice from us. They will seek those professors whose specialty they wish to pursue. In Prof. A. W. Hofmann's laboratory they will find excellent facilities for working up the aromatic compounds, making aniline colors, etc. Liebermann in Berlin, at the Technical School, will also aid them in this line. At Würzburg and several other places the fatty bodies are studied. At Heidelberg inorganic chemistry leads; the preparation of rare metals and gas analysis are best learned there. Ad. Wurtz in Paris also admits students into his laboratory at the Ecole de Médecine. For technical chemistry Zürich is said to be one of the best places.

With many the object of going abroad is twofold: to learn the language while studying science, and at the same time to enjoy the art treasures of the Old World. Such persons will be influenced more or less by other conditions than that of finding the best laboratories for work. The school terms in Germany are so arranged that the student gets two vacations of nearly two months each, one at Easter, the other in autumn. The former may be devoted to a trip in Italy; the latter reserved for Switzerland, Russia, or Norway.

We would strongly advise all who can do so to complete a course in one of our best colleges or scientific schools before going to Germany to study science. Immediately upon graduation the student should sail for Bremen, and after a little relaxation settle down to study the language in some quiet town, where beautiful scenery and pleasant walks will often enough tempt him from his books. The native student tramps a great deal, and is never reluctant to have an American for a companion, thus improving his own knowledge of English, while helping the latter immensely.

Late in October the lectures begin. The programmes of lectures are sold in the bookstores, and the student selects those he prefers to hear. It is well to move into the university town and secure a furnished room (*Wohnung*), or board (*Pension*), before the term opens. There are many reasons why it is well to pass the first term, or better still the first year, in Heidelberg, and therefore we shall begin with a brief description of the advantages to be obtained there.

The situation is a pleasant one; the city is supplied with excellent water, and is remarkably healthy; board is cheap; and the hills around afford a fine opportunity for rambles. The lectures of Professor Bunsen are well worth hearing, even if you think there is nothing more to learn in inorganic chemistry, for Bunsen is a model teacher. If the laboratory is not already full, secure a place, and begin work under his direction. His laboratory is not so fine as those in Berlin, Bonn, and Leipsic, but the professor gives you his personal attention every day and all day, which is not the case at any other German university. If you are just beginning laboratory work, spend your first term with Bunsen; if you have already some experience, you should still take one term here, preferably in summer. At that season Professor Kopp gives his excellent course in practical crystallography. Professor Rosenbusch lectures both summer and winter on mineralogy, and is one of the plainest and most instructive lecturers we have ever heard in that branch, and is authority on petrography. Physics are taught by Professor Quincke: heat and light in winter, electricity in summer. This gentleman speaks slowly and distinctly, so that foreigners have but little difficulty in following his lectures. Professor Pfitzer lectures on botany.

After finishing his course in inorganic chemistry, the student will do well to spend a winter in Berlin and a summer in Bonn or Strasburg. Although Berlin is neither an agreeable nor very healthy place for a summer residence, the student who wishes to hear Professor Hofmann's excellent lectures on organic chemistry must brave these inconveniences. Being provided with good assistants in the qualitative and quantitative laboratories, Professor Hofmann gives the student but little attention while there. If engaged in organic work of any sort, he is sure of plenty of attention and stimulation from the professor, who seems rather partial to Americans, frequently inviting them to his house. Among the numerous lecturers to be heard here we need only mention Kirchhoff, Helmholz, Dubois-Raymond, Rammelsberg, Vogel, Liebreich, and Liebermann. Libraries, laboratories, museums, hospitals, picture-galleries, botanical and zoölogical gardens, theatres, concerts, and other places of instruction and amusement render Berlin especially attractive.

Bonn has an excellent chemical laboratory. Professor Kekulé lectures on chemistry, both organic and inorganic; Professor Wallach conducts the laboratory, aided by several able assistants. The city is pleasant in summer, but the large number of English-speaking students makes any improvement in German rather difficult. Mineralogy is taught by the celebrated Von Rath, and physics by Professor Clausius.

Leipsic is a well-known literary and musical centre, and possesses one of the finest chemical laboratories in Europe. Professor Kolbe lectures on chemistry, Zirkel on mineralogy, and Hankel on physics.

The laboratory at Strasburg has been refitted, and, although not so fine as some others, is said to be an excellent working laboratory. Professor Fittig gives his personal attention to the student, and is well liked. The city is not well suited for a summer residence, nor is it very agreeable in winter. A mixture of French and German is spoken here, the former predominating, and both are very poor.

Würzburg has recently met with a severe loss in the death of Rudolph Wagner, late professor of chemical technology. Chemistry is taught by Professor Wislicenus. Those who are specially interested in the study of the fatty bodies find here the best facilities for their work. Many Americans come here to conduct physical research under the direction of Professor Kohlrausch. Von Sachs is the professor of botany, and Sandberger of mineralogy.

It would exceed our present limits to enter upon a detailed description of each of the smaller universities, although the student who wishes to isolate himself from his fellow-countrymen often prefers to study in Tübingen, Breslau, Giessen, Halle, or Marburg. Jena is under a cloud from rumors that she once sold her degrees. Göttingen is retrieving the ancient reputation that she enjoyed when Wöhler was in his prime. Professor Hübner, his successor, is highly spoken of as a lecturer and teacher.

American students are admitted to all the German universities upon presenting their passports and paying a small fee. The charge for lectures varies from $3 to $10 per term, but the laboratory fees are much higher. Each student is obliged to purchase the apparatus he uses, which adds materially to the expense. Living expenses vary so much with the tastes of the student so that no estimate can be given. The cost of degrees and diplomas may form the subject of a future article.

STEAM-ENGINES WITHOUT BOILERS.

A firm of machine-makers at Leobersdorf, near Vienna, has taken up the manufacture of steam-engines without boilers, according to Hock's patent. In this system, the steam-furnace (so called) is closed on all sides to the atmosphere by solid fire-proof masonry, and steam is formed in it from a spray of water. A blast of air is sent in under the grate. The resulting mixture of steam and gases cooled by

the water is called "air-steam;" it passes to the engine through a sieve system, which keeps back dust, etc. There is a regulating cylinder behind the air-compressing pump: it is connected with that and the atmosphere, and has a piston with weighted lever, which, on rising with excess of pressure, shuts the valve of the pump and stops the blast. Water is sprayed in the compressor to keep it cool, and then passes to the furnace for fuller vaporization. The consumption of fuel for the smallest (and so least economical) engines is stated to be one kilo. per effective horse-power per hour. Fuel is saved in virtue of the combustion being in a closed space, where expansion of air cannot occur; and with constant volume of furnace the tension of steam must increase. Another advantage alleged is in the utilizing of the gases of combustion with the steam. An Austrian specialist pronounces the mode of vaporization to be without risk of explosion.

INDUSTRIAL MEMORANDA.

Soda Ash. — Up to the present time all the soda used in this country, with the exception of a small amount made from cryolite at Trona, Pa., comes from England. The Syracuse *Standard* says that a contract has been given out for the erection of a building at Geddes, N. Y., to be occupied as a soda-ash manufactory. The probability of its success seems small, as all previous attempts, even in more favored localities than the one named, have proved failures.

Aniline Dyes. — This is another branch of industry which ought to succeed in this country, and at present the outlook is encouraging. Why it has not already reached a higher degree of perfection is difficult to explain, when raw materials are as cheap here as elsewhere, and the dyes are protected by a duty of 50 cents a pound, and 35 per cent. *ad valorem;* amounting, says the *Paint and Oil Reporter*, to an average of nearly 65 per cent. *ad valorem*. One reason that has been assigned for failure is the poor quality of the coal tar made in this country; but this seems inconsistent with the fact that we export benzole for the manufacture of aniline. At present there are no less than seven aniline factories in operation, or near completion, in the United States. Of these, one at least starts with and works on the tar, converting it into benzole, nitro-benzole, aniline oil, and salts. One company in the West is experimenting upon petroleum tar. The introduction of water-gas is destined to reduce the production of coal tar to such an extent as to make it desirable to discover some other source of benzole. Consul Mason, of Basle, Switzerland, says that there are four aniline factories near that city and one near Geneva, that together produce annually about $4,000,000 worth of these colors.

Cotton-Seed Oil. — The American Consul at Naples reports that cotton-seed oil has already found its way into the remotest mountain villages of Italy, so that unadulterated olive oil is as rare there as here. If the resemblance is, as he says, so great that the most expert cannot detect the mixture, what real harm is done? Why not save the freight from here to Italy and back, as well as the double duties, give to it some less objectionable name than it now has, refine it most carefully, and use it as salad oil? It is said that it is used in New Orleans for making artificial butter, and we could easily believe that the artificial butter would be better than the natural *Southern* butter.

Eidography. — An exchange says that a Nuremberg chemist has devised a new method of decorating silks and other fabrics, which is expected to supersede embroidery. The art is called "eidographie," and the operator uses hollow pencils which are charged with a fluid metallic compound. On exposure to the air the compound instantly hardens. Every color can be produced, and the designs traced with the pencil are exceedingly durable, lasting as long as the materials on which they are traced. Glass can be stained and wooden-ware and pottery decorated by the same process. The manufacture of the pencils has already become a considerable industry in Germany.

Liquid Carbonic Acid in Commerce. — We learn by a communication from De Haen's Chemical Works, in List vor Hanover, to the *Chemiker Zeitung*, that they have manufactured, for some time past, liquid carbonic acid gas, and sell it in cylinders, tested to 100 atmospheres (1500 pounds to square inch), of a capacity of about ten liters, at *mark* 1.50 (= 36 cents per liter). At present the railroad authorities are deliberating whether it would be safe for them to carry such packages, but it is hoped that a favorable decision will be rendered. If so, it will not be long before the liquid acid will be used in the soda-water trade.

A Lubricated Wire. — When a wire rod of iron or of steel is immersed in a hot solution of common salt, allowed to remain long enough to bring the metal to the temperature of the brine, and withdrawn, the surface of the rod is irregularly covered with deposits of crystals of salt. These crystals adhere to the rod with great firmness, in consequence, doubtless, of a thin film of ferric hydrate which is formed between them and the rod as the water dries off. The rod can now be reduced by successive passes through a die or draw plate, without any abrasion of the die. The economical advantage of this novel lubrication of wire is at once apparent, and the principle involved is interesting.

Caustic Alkalies by Electrolysis. — In extracting caustic potassa, says *Le Moniteur des Produits Chimiques*, from the mother liquor of the salt pans, a vat is employed, which is divided by a diaphragm into two cells, in one of which is put the negative electrode, and in the other the positive. The cell where the positive electrode is will contain the mother liquor, and the solution of caustic soda will be found in the other.

To Remove Ink Spots. — When ink spots occur on dyed or printed fabrics, it becomes a question whether the means employed to remove the ink will not remove the colors as well. *Ueber Land und Meer* recommends the use of phosphate of soda in such cases. The goods are moistened with warm water and rubbed with the phosphate, and then covered with a thin layer of tallow. The spot thus prepared is next washed thoroughly in moderately warm water containing some of the same salt. If the ink is not entirely removed the first time the operation is repeated.

Improvement in Making Soda. — In the manufacture of sodium carbonate by means of ammonia, a bicarbonate is first formed, which is afterwards deprived of half its carbonic acid by heating. The calcination is more difficult than might be supposed: first, because the salt is a poor conductor of heat; secondly, because it has a tendency to cake together. The latter objection is overcome by mixing it with calcined sodium carbonate. To obviate the former, Solvay pulverizes it and places it in a rotating machine, where all the particles are continually projected against the sides and partitions of a revolving drum heated externally. The contact with the heated partitions liberates the gases and vapors, and the decomposition takes place throughout the whole mass.

LABORATORY NOTES.

Chemistry of the Gastric Juice. — In a recent lecture Richet concludes that the acidity of the gastric juice is due to hydrochloric acid combined with leucin (a substance found in the mucous membrane of the stomach), and probably with pepsine. He is led to this conclusion by the fact that an aqueous solution of hydrochloric acid does not behave like gastric juice, although the gastric juice does contain chlorine. The acid is insoluble in ether, and therefore cannot be lactic acid. Hydrochloric acid, which has remained in contact with the gastric mucous membrane, now behaves like gastric juice. He further detailed some experiments that show that the gastric ferment does not resemble the living ferments of yeast, etc.

M. Bouchut's experiments with pepsine for destroying worms in the stomach and bowels give promising results. Even the tapeworm succumbs to its digestive action.

Analysis of Pepper. — Lucä gives the following as the composition of Ceylon white pepper: —

	Per cent.
Water	11.71
Piperine	2.23
Resinoid matter	17.44
Nitrogenous matter	7.82
Starch	28.43
Oil	2.15
Mineral matter	5.20
Cellulose and loss	24.02
	100.00

The quantity of starch in pure pepper is worthy of note, and shows that it would be unfair to consider its presence as proof of adulteration. Another specimen analyzed (source not given) contained only 18.5 per cent. of starch. Ceylon ginger contains 29.4 per cent. starch. Nutmegs contain little or no starch.

Fehling's Solution. — We are frequently asked for the best method of making an alkaline copper solution for detecting and estimating grape sugar. Where a qualitative test only is required we take about 5 or 6 cc. of a dilute solution of pure copper sulphate, and add to it as much pulverized tartaric acid as will lay on a nickel, or twice that amount of Rochelle salt; then enough strong solution of potassium or sodium hydrate to give it an intensely blue color. No precipitate should form on boiling. The liquid is added to the blue test solution and boiled. A red precipitate of cuprous oxide (Cu_2O) indicates the presence of glucose (amylose), or invert sugar.

For quantitative work, 34.64 grams of crystallized copper sulphate is dissolved in hot water, and the solution, when cold, is diluted to exactly 500 cc. Five cc. of this solution will then correspond to 50 milligrams of dextrose, or pure grape sugar. At the time of using, a sufficient quantity of tartaric acid and an excess of caustic alkali may be added, as in qualitative tests. A better method consists in mixing 5 cc. of the copper solution with 5 cc. of the following solution, made by dissolving 68 grams of pure sodium hydrate and 187 grams of Rochelle salt in water, and diluting to 500 cc. Place 5 cc. of each solution in a porcelain capsule, and add 30 or 40 cc. of distilled water, and boil. If no precipitate is formed, the solution to be tested, which must contain about 0.5 per cent. of sugar, is run into it from a graduated burette. As soon as the blue color seems to be destroyed, take out 1 cc. of the solution, filter through a very small wet filter into a white dish and test it with one drop of potassium ferrocyanide acidulated with acetic acid. If the precipitate of cupric ferrocyanide is noticed, add more of the sugar solution, boil again, and filter 1 cc. through a fresh filter. Repeat, until a sufficient quantity has been added to reduce all of the copper. The sugar solution consumed contained 5 mg. of grape sugar, or invert sugar. If just 10 cc. of the sugar solution were required, the solution contained 0.5 per cent. of glucose; if only 5 cc. were consumed, it contained 1 per cent.; and in general the percentage of sugar is found by dividing 5 by the number of cc. consumed.

To test the correctness of the copper solution, dis-

solve one gram of pure dry sugar in 100 cc. of water, invert it with acid, neutralize and dilute to 200 cc. It will require 9.5 cc. of this solution to reduce 5 cc. of the copper solution, when properly made.

A more accurate but far more tedious method consists in using an excess of the copper solution, collecting the cuprous oxide on a filter, and estimating the amount of copper by any one of the numerous methods already known.

Agriculture.

WHAT SCIENCE HAS ACCOMPLISHED FOR FARMERS.

One of the oldest and most prosperous of the agricultural societies in Massachusetts is the Essex, and this year, in September, the annual cattle show and fair was held at the city of Haverhill. With the immense population of the county, embracing the cities of Salem, Newburyport, Lawrence, Lynn, Gloucester, etc., the attendance at the fair was large, and its success abundant.

The annual address was given by Dr. Nichols, editor of the Journal, upon "What Science has Accomplished for Farmers." Brief extracts upon two branches of the address are given below, and others may be presented at a future time: —

AGRICULTURAL EDUCATION.

In any statement of the benefits which science has conferred upon the farming interests, the inference must naturally follow that very many farmers have not secured or participated in the benefits so freely and generously offered. This arises from several circumstances and obstacles. Some are naturally disinclined to examine into new methods and new discoveries; they prefer the old ways, and have little confidence. Others are too indifferent to give attention to that which requires a little thought and the exercise of discriminating judgment. There are farmers, as well as men in other pursuits, who seem to have been born under the influence of evil planets; their dish, so to speak, is always wrong side up. They come into the world the discouraged offspring of perhaps discouraged mothers, and their mental feebleness unfits them to command advantages which the world offers. But the greatest obstacle is a want of proper instruction, the want of some elementary training in the principles of science to afford a foothold for independent investigation and self-culture. The whole theory of agricultural education is based on the idea that farmers' boys and the young men must be educated by attending some agricultural college, so called, for a term of years; but the farmers themselves, the real workers in the field, may be left to obtain light and help from the profitless disputes and endless discussions common in farmers' clubs, or from the vapid talk of politicians at fairs and cattle shows. This is manifestly all wrong, and I am certain, gentlemen, you will sustain me in so judging. It is an erroneous view that men in middle life, and those further advanced, are not willing to be instructed accurately in those branches of scientific knowledge which give to modern husbandry all its important advantages. The young men may attend the agricultural colleges or any other institutions of learning, and be greatly benefited by a prolonged course of study; but we need another kind of college, — a *farmers' college*, where the practical workers can be graduated without diplomas, at the end of a brief course of instruction extending over a few days or weeks.

I believe that instruction in the most important branches of science, which have a direct practical bearing upon every-day work on the farm, can be so shaped as to prove eminently useful and attractive to men who are now conducting the great farming industries of the country. There is an intense eagerness for sound and accurate knowledge among such men, and the want of it is, in my view, the greatest hindrance to agricultural progress. This knowledge is to be distinguished from that which is presumed to be obtained in clubs and institutes, inasmuch as one is based on demonstrative facts and positive knowledge; the other is founded, to a great extent, on hasty statements and untrustworthy farm experiments.

The language of science and its methods seem to most as unintelligible and very difficult to be learned. It is so to a certain extent, but abstract science need not be learned. It would be absurd to attempt to teach a middle-aged workingman fully regarding chemical symbols and formulas, but you can teach him how to estimate the money value of a fertilizing compound offered for sale in the markets. How few the purchasers who are competent to sit down in a store before a bag of that apocryphal mixture called "superphosphate," and from the labels or stencillings which purport to present a statement of the nature of the compound obtain any clear information of its constitution or actual value! Every farmer certainly ought to be able to do this for his own protection, and there is no good reason why he cannot.

These views are based on many years spent in scientific investigation and technical work, and on twenty-five years' experience in conducting the affairs of an experimental farm. From intimate association with practical husbandmen in many parts of the country, I am convinced that they can easily acquire the leading facts and principles in any department of science, if right methods of instruction are adopted, and that it is a wrong view which confines instruction to youth, and ignores the busy working middle-aged man who is hungering for light and knowledge.

INFLUENCE OF SCIENCE UPON FRUIT CROPS.

Prominent among the benefits conferred by science is the improvement of our fruit crops. It does not require a memory extending over many years to recall a period when the apple was confined almost exclusively to varieties suited only to cider making; and as regards pears, until within thirty years none of the really good varieties were known upon our farms. Peaches we had to some extent, but the fruit was acid and imperfect. Fifty years ago, not a single horticultural society existed in the United States, and there were but few agricultural societies; now there are more than fifteen hundred state and county organizations. At that period the products of our soil were so insignificant as not to be thought worthy a place in the statistics of our industry; now our exports amount to more than six hundred millions of dollars annually. Of apples alone we exported last year one million three hundred thousand in value, and of canned fruits nearly one million. As regards the soft fruits, strawberries and raspberries, I do not remember to have seen cultivated varieties until long after reaching adult age. Now we have of strawberries alone, cultivated in gardens, more than three hundred and fifty distinct varieties. Of grapes we formerly had none but those which grew wild in the swamps; now we have about one hundred varieties under cultivation, and grape culture is an industry of immense importance. We are rapidly approaching a time when this country will be the greatest wine-producing region in the world. Of pears we have now more than eight hundred and ninety varieties, and on many farms and in many gardens this noble fruit is grown in such abundance as to become almost a waste product. Our county of Essex is peculiarly adapted for fruit growing, and it has become a source of considerable revenue to farmers. We have not been able to supply our markets with peaches in late years, but I confidently believe that we have entered upon a cycle of time when this fruit will not continue to fail us. Disease in the tree and fruit, caused perhaps by insects, is a greater obstacle to contend with than climate. Careful observation, extended over many years, leads me to conclude that the failure of the peach crop has not been due to our severe winters. Fruits manifestly are subject to laws of periodicity, that is, they have cycles of barrenness and great productiveness; and it is probable the pear is now near the end of a cycle of extreme over-production, and the peach is entering upon one of generous production. The widespread leaf blight in the pear is a significant indication of waning vitality, and the fruit now so abundant as almost to create disgust may soon become the rarest and choicest of any upon our tables. The peach crop in the Middle States has, the present season, failed to a large extent, whilst that in Massachusetts would have been very large if disease had presented no interference. The enormous value of this crop to New Jersey, Delaware, and Virginia is but imperfectly understood, and it is only from statistics that we obtain correct knowledge. The long trains of cars loaded with the fruit brought over the New England Railroad convey not only the most delicious morsels to tickle the palate, but rich odors, more grateful to the sense of smell than those which came from "Araby the blest." It is known that the odor of the peach is perceptible in the atmosphere along the line of the railway for a considerable time after the trains have passed.

SEWAGE FARMING.

How to get rid of the sewage of large cities and towns is beginning to be a serious problem in this country, as it has long been in Europe. The direct application of the sewage to the soil as a fertilizer is, on the face of it, the simplest method, wherever sufficient land is available for the purpose; but there has been a strong popular feeling against this method, from fear that the diffusion of sewage over extensive areas will give rise to emanations of the same noxious character as those produced in sewers, and especially to the propagation of zymotic diseases; or that, at the least, a nuisance will be created, leading to the deterioration in value of adjoining property. Another objection which has been urged is that the health of animals pastured on sewage farms must suffer in some way, and their flesh and milk be therefore rendered more or less unwholesome. That this objection has any solid foundation whatever has yet to be proved; and though it may be conceded, as a mere possibility, that the ova of *tæniæ* might be found *on* the fodder of a sewage farm, and thus be swallowed by the cattle, it is absurd to suppose that crude organic matter can be taken up unchanged into the vegetable tissues. Lastly, there is the apprehension that the soil may be incapable of getting rid of such a volume of fluid as is employed in irrigation, and may be converted into a fetid swamp.

All these objections are completely refuted by the experience of the Local Board of Health of Croydon, England, extending over twenty years, whose sewage farm at Beddington is thus described in a recent number of the London *Medical Times and Gazette*: —

The total area of the farm is 540 acres, but of these only 450 are regularly irrigated. On these is poured daily the sewage of about 63,000 persons,

averaging in dry weather 2,000,000 gallons, but rising, when the rainfall is added, to sometimes twice that volume, with no further treatment than a coarse straining to separate sticks, rags, paper, and such solid masses. The sewage is conveyed to every part of the estate by a system of channels and feeders, and turned on to each field in order for twelve to twenty-four hours at a time. The smallest trenches are dammed at intervals by boards, to distribute the flow over the land. After having been thus filtered through one field, it is conducted in like manner to a second or a third before it is allowed to pass into the river Wandle.

The effluent water is clear, and devoid of taste and smell, and numbers of young fish may be seen in the conduit by which it leaves the farm. Even in parts actually submerged to the depth of an inch or more, no odor is perceptible; none anywhere, in fact, save in the neighborhood of an uncleansed ditch, and there not to be compared with the stench arising from the turning over of an ordinary dung-hill.

In short, it may be now taken as proved that sewage in a state of minute subdivision and of intimate contact with fresh earth does not undergo the septic changes to which it is prone in mass. On this depends the sanitary success of the earth-closet; but the sewage farm presents this advantage: that while the growing vegetation, constantly removing organic matter from the land, keeps it from becoming surcharged therewith, it at the same time avoids that prolonged, and therefore complete and destructive, oxidation of the organic matter which detracts so much from the fertilizing power of the earth from the closet.

The principal crop, as on all sewage farms, is Italian rye-grass, a plant whose powers of absorption are enormous. On common pastures it yields two crops in a season; here it is cut seven times, each crop averaging fifty to sixty tons, and worth £5 to £6 per acre. It is mostly used as green fodder, but there is no reason why it should not be made into hay, which would find a ready sale. Mangel-wurzel is also largely grown. These crops are specially suited for sewage culture, but none need be excluded, and good fields of wheat may now be seen on land which has not been irrigated since the corn was sown. The cattle kept on the farm are fattened for the butcher solely on its produce at the rate of four head per acre, ordinary pastures supporting not more than one.

The question of the influence of sewage farms on the health of the surrounding population has also been conclusively settled by the farm under consideration. The population of the adjacent town of Croydon has risen in the past decade from 53,000 to 77,000, and the birth-rate, which always entails a proportionate mortality, is unusually high; yet the death-rate of Croydon has steadily decreased, until for several years it has not exceeded 16 per 1000,—that of London being 22. In Beddington it is only 14 in a population of 5000, many of whom unwittingly drink the effluent water, as is shown by the rise in the nearest wells which follows each irrigation. In the very midst of the farm stands the Orphan Asylum, and visitors bear witness to the healthy appearance of the girls,—165 in number. About one death has occurred yearly from phthisis or tubercular disease; there has not been a fatal case of any zymotic disease.

All opposition in the neighborhood has been disarmed by experience, and the value of property in Beddington has doubled in the last ten years, the proximity of the sewage farm not having deterred the wealthy citizens of London from erecting their villas around.

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An enterprising Frenchman wants to rent a part of the Mammoth Cave for raising mushrooms.

GLEANINGS.

The Cultivation of Chestnuts. — The *Rural New-Yorker* remarks: As a remunerative crop, chestnuts have not received their share of attention, and we presume it will be long ere the raising of chestnut-trees is made a part of our rural industries. But may there not be money in it? In some foreign countries the chestnut crop is equivalent to the wheat crop in America, both as respects its money value and the uses to which it is put. Chestnut bread, a thing of which Americans are wholly ignorant, constitutes the principal food of thousands in Europe and Asia. The fruit is ground into meal, and puddings, cakes, and bread are made from it. Ohio statistics show that her chestnut crop is valued at $60,000, and it could soon be made to reach ten times that amount. The tree is of quite rapid growth, attaining the height of fifteen to twenty-five feet in five years, from the seed. It is, as we know, valuable as timber; can it not be made more valuable here for its fruit?

Nurseries in the United States. — A few years ago many of the large nurseries in America became overstocked with salable trees, because land-owners were restrained by the hard times from purchasing, and not because every one had trees enough to give a good supply of fruit. Taking all the country residents together in the Union, a comparatively small portion have as yet fully provided themselves with orchards and fruit gardens. Planting fruit trees is now going on again with increased attention, but one of the strongest influences in favor of setting out large orchards is the new markets which are opening, in the shape of the vast foreign demand and the immense home consumption in the canning and drying establishments, and in the manufacture of jellies and vinegar. The *Gardener's Monthly* stated, in its report of the nurserymen's convention at Dayton, that it was estimated that the railroads alone carry annually 40,000,000 dollars' worth of nursery products over their lines. A proof of this vast trade is shown by the insufficient appliances which these railroads seem to possess, and by the long and fatal delays to which large shipments were in many instances subjected during the past season.

The Cultivation of Soy. — According to a French engineer, M. Roman (in *La Nature*), the cultivation of the interesting plant, *soja* or *soya*, has been largely developed in Austria-Hungary (besides Italy), and in various parts of France, notably at Etampes and Montpellier. He is of opinion that it will probably play as important a part in the future as the potato. It grows in any soil, even the driest, and it furnishes an excellent fodder for cattle. The seeds have the form of small kidney beans, but contain 37 per cent. of proteic matters, 20 per cent. of fatty matters, and only 3 per cent. of fecula; so that the nutritive properties of soja are considerably greater than those of beans and lentils. An agreeable soup may be made of them. The Chinese use them for various kinds of cheese, make a condiment with oil, etc. In France, the seeds have been roasted like coffee, and M. Roman says the perfume and properties of the decoction of soja are quite similar to those of average coffee. Mixed with milk, the decoction of soja is better, he considers, than the most fragrant coffee, while it costs in France only about one third as much, or 1.20 francs (24 cents) a kilogram (2½ pounds).

Green and Red Lights in Vegetation. — Why will grass not grow under our trees? M. Paul Bert has shown that green light hinders the development of plants. Plants inclosed in a green glass frame wither and die as though they were in darkness. M. Regnard finds that plants specially require the red rays. If sunlight is deprived of the red rays, the plants soon cease to thrive.

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, NOVEMBER 1, 1881.

THE PARIS ELECTRICAL EXHIBITION.

So far as information has been received, it does not appear that anything specially new has come into notice from the great electrical show at Paris. It is clear that a vast number of huge and expensive toys have been exhibited, as railways, balloons, boats, etc., moved or controlled by electrical force, but these exhibits add nothing to our stock of knowledge.

The preference, so far as the electrical arc light goes, remains with the American and French inventors; the Brush machines taking perhaps the highest position. Light from incandescence has many competitors, but the highest success, or the most promising light of all, was that of Swan, of Manchester, England. What special merit it possesses over Edison's, Sawyer's, Maxim's, and a host of others, is not clearly shown. The struggle to attain success in this form of electrical lighting is intense, but the hope of practical success is not brighter at the present time than a year or two ago. By success is not meant the production of a beautiful light, which under favorable conditions will last for weeks or months; this has been accomplished. Success means a light which will be a decided competitor with illuminating gas; not more costly, and not liable to disarrangement and failure under ordinary skill and care. This result has not been thus far reached.

As regards electrical railways, the Messrs. Siemens, of Berlin, are the most prominent experimenters, and they have a practical railway on exhibition in Paris. This celebrated house have connections in Paris and London, and stand out prominently as makers of dynamo-machines of a high order of merit. They claim to have put in motion the first electrical railway of a practical or promising character in Berlin in 1878, and one or more are now in use in that city, doing, it is alleged, successful work.

The difficulties under which these gentlemen prosecuted their labors in Berlin form an amusing chapter in the history of invention. In that city it is necessary to obtain permits to try experiments, and when the Imperial functionaries were asked to allow of the construction of an experimental electric railway in one of the streets of the city, two months of valuable time was taken for consideration, and then projectors were told that "Berlin was not in want of electric railways." However, after persistent importunity a grant was secured and a railway built, and the permissible speed of the cars is under twelve miles an hour, although the engines are capable of carrying twenty passengers twenty-two miles an hour. This railway, built at the sole expense of Messrs. Siemens and Halske, is still worked by them, and does sufficient business to cover its working expenses. It does not yet appear, however, that electrical railways can be made successful rivals of those where cars are moved by steam or horse power.

The most interesting of all the exhibits at Paris, in our view, are those which show how

electrical force may be stored and made portable. Great improvements have recently been made in this direction, and Brush, of the well-known arc light, claims to have distanced all competitors in his new devices. By his improvements, as alleged, he can now store up in proper vessels enough force in the day-time to run his electric lights at night, dispensing with the use of the dynamo-machines after sundown. If this is true, a grand step has been taken in electrical science, and the promise for the future is indeed flattering. If unused water power can be employed to charge retaining vessels with electrical energy, so that it can be transported and used at pleasure, who can comprehend the magnitude and importance of this discovery?

It may be possible in the future largely to dispense with horses in forms of work in which they are now regarded as indispensable. If the time ever comes when one who wishes to take a ride in the country can go to the livery stable and order a carriage and a box of electrical force capable of conveying him one or ten miles, it will require more than the usual forty-eight hours to become used to the new order of things. It is indeed easy to see how electrical force in compact and available condition may be applied to drive carriages, and how it may be managed and controlled by ordinary men and women. A very picturesque vehicle can be constructed, to be propelled without noise or smoke over common roads, at high or low rates of speed, and without danger from explosion or electrical accidents. All that is wanted is the boxed-up force, not involving too much space or weight, and the way is clear for the rest. We are evidently still on the outer verge of the field of discovery, and the one motive of all others which creates desire for a long continuance of life is that we may look upon and participate in the inestimable blessings which future discovery must confer upon the race.

CISTERN WATER.

We have received frequent inquiries regarding the use of cistern water for drinking purposes. No general reply can be given that will hold good in all cases. Under certain conditions cistern water is found to be very pure, and excepting for the flat, insipid taste is preferable to most well water. First, then, in considering whether cistern water is fit to drink, we ask whether the roof on which it falls is of tin, wood, lead, or slate. Are any injurious metals employed for gutters or leaders? Is the house surrounded by overhanging trees, from which the leaves collect in the gutters and are washed into the cistern? Do pigeons or fowls frequent the roof and soil it? For these and other reasons it is not advisable to permit the first washings of the roof to enter the cistern.

The cistern itself should be well made, carefully cemented, and thoroughly cleansed at least every two years. It should have free access of pure air, not the air of a cellar, and the pump-pipe should not reach too near the bottom so as to stir up the sediment. It is well to throw into the cistern from time to time a peck of freshly burned charcoal. One corner of the cistern may be walled off with porous brick, so as to strain the water that passes through, and the pump-pipe may be placed within this little cell.

Lead pipe must under no circumstances be placed in a cistern, because lead is attacked by soft water, and here both exterior and interior are exposed to its action. Iron is less objectionable, but it is preferable to have it coated within and without with asphalt varnish, or, better yet, with india-rubber.

When cistern water acquires a bad smell, stop using it, except for cooking or making tea. If it is during the dry season, when you cannot afford to pump it out and cleanse it, try the addition of charcoal and forcing air through it.

Cisterns ought not to be in close proximity to drains and cesspools, although they are much safer than wells similarly situated.

BOSTON GAS.

The following analysis of the gas furnished by the Boston Gas-Light Company was recently made for us by A. P. Hallock, of New York city. It is similar to that made by the Manhattan, of New York, as given by E. G. Love. We place the two side by side for comparison: —

	Boston.	Manhattan.
Hydrogen	46.54	45.79
Marsh gas	36.10	39.01
Carbonic oxide	7.84	6.31
Carbonic acid	1.02	—
Nitrogen	2.65	2.51
Illuminants, olefiant gas, etc.	5.85	6.38
	100.00	100.00

PROFESSOR WINCHELL ON EVOLUTION.

In a lecture before the Summer School of Christian Philosophy, at Greenwood Lake, Prof. Alexander Winchell, of the University of Michigan, discussed the speculative consequences of evolution. Speaking of the predicament of those who stake all religious truth on an allegation of the untruth of evolution, in case the method of nature is finally found to be a method of evolution, he said: —

"At this moment the well-nigh unanimous verdict of the scientific world sustains the doctrine of evolution. This verdict is one of the criteria of truth. Repudiation of it is a hazard which only rashness and ignorance will incur. To stake all religious belief on such repudiation is to throw all of man's spiritual interests upon the hazard of a die. As I understand it, the recognition of a method of evolution in nature's operations does not involve consequences deleterious to a spiritual faith, but is a means, on the contrary, for approaching into closer relations with the immaterial forces of the divine government of the world. We must first establish a clear conception of evolution. Multitudes of men imagine evolution and Darwinism to be synonymous terms, if they do not even believe them synonymous with materialism, as is so often charged. I conceive the evolution which I discover in nature to be the progressive differentiation of an identical existence. It proceeds from the more general to the more special, from the homogeneous to the heterogeneous. It means that new forms of existence are only older existences transformed, and not new beginnings of existence. Every department of the cosmos has had a history, and every present is the outcome of a past. It takes no cognizance of special originations, but only of the history which follows. Evolution, I say, knows nothing of creation. This is not because it contravenes creation, but simply because creation is an event which does not come within its purview. Evolution is the name of a mode of continuance, not of a mode of beginning. It can neither affirm nor deny any mode of origin."

IN BEHALF OF THE PUBLISHERS.

The annual bills will be enclosed with the *next* (December) number of the Journal, and the publishers request that we will bespeak for them *immediate* attention on the part of the recipients. This may properly be urged, not only for the obvious reasons that the money is honestly due and is needed for the expenses of publication, but also because, as we have reminded our friends on former occasions, they are apt to forget the trifling demand if they do not respond to it promptly. Large debts are more likely to be kept in mind than little ones; and the only safe rule in regard to the latter is not to run the risk of overlooking them, but to pay the bill as soon as presented. We hope that all our readers will act on this advice as soon as they receive the bills; and also that, in making their remittances, they will not fail to observe the directions in the "Special Notice" at the head of the last column of page 132 of the present number.

We would also call attention to the revised "Clubbing List" presented by the publishers in the advertising department of this number. It includes the best American and foreign periodicals of professional and general interest, and we believe that there are few of our readers who will not find in it something that they want. They will see that in many cases the Journal costs nothing when ordered in connection with a periodical on the list, the discount on the latter being equal to the full price of the former; and in all other cases the saving is considerable. Do not fail to look over the list carefully, and send in your orders in good season for the coming new year. The publishers will be happy, on application, to give rates for any American or foreign periodical which does not appear on the list. Our "clubbing" arrangements are more extensive than those of any scientific journal (perhaps we might say of any journal whatever) in the country, and in the course of the last few years we have sent many thousands of dollars to the publishers of other periodicals, to their advantage no less than to that of our own subscribers.

It is understood, of course, that all applications for specimen copies of any of these periodicals should be addressed to the publishers of the same, to whom also requests for missing numbers should be addressed.

METEOROLOGY FOR SEPTEMBER, 1881.

The sum of my observations on the weather for the past month has been as follows: —

Average Thermometer.		Lowest.	Highest.	Range.
At 7 A. M.	62.66°	50°	73°	23°
At 2 P. M.	72.96°	62°	90°	28°
At 9 P. M.	64.48°	54°	78°	24°
Whole month	66.69°	50°	90°	40°
Last 18 Septembers	60.30°	54.90° in 1864.	66.69° in 1881.	11.79°

The average barometer for the past month was 30.021 inches, the lowest 29.86, and the highest 30.32, a range of only .46 of an inch. The sum of daily variations was 2.64, giving an average daily movement of .088 of an inch. The average for the last nine Septembers has been 30.019 inches, only three times below 30 inches, the lowest 29.926, and the highest 30.141; showing September to be above the yearly average (29.919) by one tenth of an inch.

The face of the sky in 90 observations gave only

44 fair, 10 cloudy, 29 overcast, and 7 rainy. The amount of rain was 2.15 inches; the average for the last thirteen years being 2.31, the lowest .45 in 1877, and the highest 6 inches, in 1872, a range of 5.55 inches. We had unusual thunder and lightning for September on the 13th, 23d, and 24th; that in the night of the 23d was very severe.

The direction of the wind gave an excess of only three northerly and twelve westerly over the southerly and easterly, indicating the prevailing direction to be west 14° north, or full W. by N. The average direction for the past thirteen Septembers has been west 4° 30′ south. In seven years the northerly excesses amounted to 60, while the southerly excesses of the remaining six years amounted to 84. In only one instance (1874) was there an easterly excess over the westerly, and then by only two observations.

The temperature of the past month has been excessive for September, being nearly 6.4° above the average, and 3.13° above the next warmest, during the past eighteen Septembers. No signs of frost during the month. The amount of rain was nearly an average, but with unusual thunder showers and sharp lightning for September. The weight of the atmosphere was uniformly high, not going below 29.86 inches. But the most remarkable feature of the month was

THE DARK DAY,

on the 6th; or perhaps it should be called the *yellow day*, to distinguish it from the notable "dark day" of 1780. The sky assumed a preternatural appearance from early morn, till at midday artificial light was required in numerous offices and places of business, and even at the dinner-table. Many fowls sought the roost. Everything appeared of a peculiar tinge, much like that produced by looking through smoked or stained glass. Vegetation appeared peculiarly green, or blue, as some expressed it, yellow objects of a sallow white, red objects unusually brilliant, and the blue wore a ghastly look. The phenomenon disappeared somewhat suddenly about sunset, and all things assumed their natural aspect. The air was remarkably still and calm during the day, and produced a feeling of confusion with some, while it made a solemn impression on others, some even anticipating the end of the world. The effect was doubtless due to the smoke from extensive fires in the forests of Canada, mingling with a peculiar fog or overcast sky. The terrible fires were then raging also in Michigan, but were too far away for their smoke to reach New England on that calm day.

It is also worthy of special note that the day following was excessively hot, the warmest of the present year, though so late in the season. The thermometer stood at 71°, 90°, and 78°, at the usual hours, an average of near 80°. At two P. M. it stood at 90° in my usual N. E. exposure, but at 97° in a northerly shade, and at 118° in the direct sun. It stood at 88° at four P. M., and 83° at six. The highest points reached during the past eighteen Septembers averaged 83.7°, ranging from 76° to 90°; while the highest July points have averaged 89.9°, ranging from 85° to 95°, and reached 90° or upwards nine years during the eighteen. The press gives somewhat higher numbers for September 7th than stated above, reporting in several of the cities in Massachusetts from 100° to 102°; in Boston 101.5°, "the hottest day Boston has seen for at least the last eleven years." The signal service report the highest point 96.7° at 3.23 P. M., with an average through the day of 84.4°. The heat is usually greater in cities than in the country, owing probably to the stone and brick buildings becoming more intensely heated than vegetation.

But why such intense heat in this September, not only for a single day, but such high average through the month? There must be some cause; nor does it seem an earthly one, for the rain-fall was about as usual, and the amount of cloudy and overcast weather was excessive. Must there not have been unusual activity in the sun itself? Must not fresh fuel have been recently added by the fall of cosmic bodies into it, or some mighty eruption or conflagration have taken place? Close telescopic observers of the sun have suggested that this is probable.

D. W.

NATICK, *October* 8, 1881.

EDITORIAL NOTES.

TAXING TOBACCO IN A BOTANICAL GARDEN. — The German papers relate an extraordinary story from Königsberg, in Prussia. A short time ago two revenue officers appeared in the Botanical Garden which is attached to the famous University founded by Albert I., Duke of Prussia, and surprised the resident director with the inquiry whether any tobacco was grown in the garden. He replied that there were six beds devoted to the cultivation of tobacco of different sorts, arranged in scientific order, for the instruction of the botanical students. The officers duly inspected the quarter in which the taxable weed was flourishing in so many different species, and then asked if it was ever employed for any other purposes besides education. The director smilingly replied that neither he nor the professor of botany happened to be smokers, and the workmen would be instantly dismissed if they were discovered to use the University property for their pipes. Hereupon the two revenue officers declared that they were satisfied, and left the tobacco to flourish free of taxation. A few days later, however, the two men came again, and informed the director of the Botanical Garden that their superior officer had charged them with being too remiss, and that they must levy a tax upon the specimens of tobacco cultivated for the sake of botanical science. The director said that he was not willing to pay the tax; that the professor of botany, who was absent on his vacation, would not be likely to pay it; and that, if there were no other remedy, the specimens might be rooted up. The officers answered that they had been ordered to destroy all the plants in the event of the tax being refused, and this was actually done.

AMERICAN CARS IN ENGLAND. — John Bull hates to change any of his bad old ways of doing things, and has obstinately resisted the introduction of our form of railway cars, baggage checks, and the like; but he has a natural repugnance to being murdered, and will now and then adopt an improvement rather than run the risk of having his throat cut while travelling. The Pullman cars have been used for some time by the Midland Railway Company, which seems to be the most progressive of the great English railway corporations, and a few of these cars have been put, as an experiment, upon other lines. The London papers now state that since the recent tragedy on the Brighton railway "the demands made upon the Pullman car accommodation have been so great as to be in excess of what is at present at the disposal of the company. The directors have consequently decided to run a train each way every day to be composed entirely of Pullman cars." It is stated also that the Midland Company have decided to place a dining-room car on all their express trains between London, Liverpool, and Manchester. If this thing goes on, railway travel in England will soon become comparatively endurable to the Yankee tourist.

ZINC-LINED AND GALVANIZED-IRON CISTERNS. — The JOURNAL has always discountenanced the use of zinc and galvanized iron in cisterns and other receptacles for water used for drinking and cooking. Opinions differ as to the deleterious effect of zinc upon water, but the weight of evidence is against its use. In the excellent rules just adopted by the New York City Board of Health, for plumbing work in dwelling-houses and other buildings, we find the following: —

"14. Cisterns for drinking-water are objectionable; if indispensable, they should never be lined with lead, galvanized iron, or zinc. They should be constructed of iron or of wood lined with tinned copper. The overflow should be trapped, and should discharge into an open sink; never into any soil or waste pipe or water-closet trap, nor into the drain or sewer."

Doubtless this, like the other rules laid down, is the result of careful investigation and consideration on the part of the Board.

LITERARY NOTES.

A Manual of Sugar Analysis is the title of a new and valuable contribution to the literature of sugar, by J. H. Tucker, Ph. D., of New York; D. Van Nostrand, publisher. The author devotes the first chapter to the chemistry of sugars as a class, and then describes the different varieties of cane sugar, their preparation, properties, and decompositions. The most valuable portion of the book is that which relates to the analysis of sugars and syrups. It embraces a brief but clear description of all the methods employed or proposed for determining sugar quantitatively, both volumetrical and optical, including illustrated descriptions of all the saccharimeters, with the address of their manufacturers. The author also gives full references to the original sources of information, which will prove useful to those who may wish to investigate the subject more fully. This is one of the few books, if not the only one, in which the effect of maltose and dextrine upon the determination of glucose is satisfactorily described.

Text-books on chemistry are multiplying so rapidly that it is no longer difficult to select one adapted to the wants of any schools of any grade or kind. Among the latest is the *Elements of Chemistry*, by Professor E. M. Avery, published by Sheldon & Co. It is beautifully illustrated by new wood-cuts, and full of experiments, many of which can be performed by the student himself. Although intended for the use of beginners, it carefully explains the important principles that underlie the science, and describes and illustrates combination by volume, molecular formulæ, etc. Teachers will do well to examine this book when selecting their text-books for the winter.

A Supplement to Poggendorff's Dictionary of the Exact Sciences, Biographical and Literary, is in course of preparation by Dr. W. Feddersen, Leipzig. It is his intention to include the names of distinguished American scientists, and we hope that our friends will promptly respond to any calls that he may make upon them for information. Specimen sheets and blanks for filling out can be obtained from the office of the BOSTON JOURNAL OF CHEMISTRY, or of Dr. Feddersen, Carolinenstrasse 5, Leipzig, Germany.

Education for September–October contains a very interesting paper, by James W. Bell, on German Universities. On the whole, this new candidate for popular favor is not inferior to the earlier numbers, which have evoked such favorable mention from the press.

The *Atlanta Medical Register* is the new name under which the old *Atlanta Medical Journal* comes to us. Its new editors, Drs. Johnson and Baird, announce that it is an independent journal, and shall never become the organ or instrument of any faction, firm, organization, or institution. From a personal acquaintance with one of its editors we shall expect a live paper, well edited, and always up to the times.

The *Keystone Medical Journal* is a new periodical, edited by J. R. Borland, M. D., Franklin, Pa., which sets up its motto as "Fearless and Free," and advocates "rational medicine." It claims to be searching for the better way in therapeutics. Success to it!

The Utah Review, Rev. T. B. Hilton editor, is a new 32-page magazine that comes to us from Salt Lake City. We learn from it that the city of the saints now enjoys a university, chartered February 4, 1881. We hope that these two institutions will succeed in letting much light into the dark places of Mormondom.

The excellent American reprint of the London *Lancet*, perhaps the most widely known of all the English medical magazines, has been added, on unusually favorable terms, to our "Clubbing List," and is well worthy the attention of our professional patrons.

Another journal which we are enabled to offer at a very liberal rate is *Science*, which is now fully established as the American counterpart of *Nature*.

The new *Natural Philosophy*, by Messrs. Gillet and Rolfe, has appeared since our last number was issued, and immediately received the high compliment of being adopted as a text-book in the Stevens Institute of Technology, at Hoboken. We shall refer to the book more at length hereafter. The *Elements of Natural Philosophy*, which is a smaller and easier manual, will probably be ready by the time that this number of the JOURNAL reaches our readers. The next volume to be issued in the series will be the *Astronomy*.

Medicine and Pharmacy.

MALARIA IN NEW ENGLAND.

We remember that the late Governor Andrew, in an address before one of our agricultural societies, referred with eloquent pride to the fact that the soil of Massachusetts was free from malaria. It would grieve him, were he still with us, to be compelled to retract the eulogium upon the old Bay State; but it must be confessed that she has lost her former prestige in that respect. Malaria has lately been showing itself not only in various localities in Massachusetts, but in many other parts of New England. The fact is attracting much attention among physicians and sanitarians, and has been discussed in the *Boston Medical and Surgical Journal* and other professional periodicals.

Malaria is not a new disease to New England, but has appeared now and then in different localities ever since the settlement of the country. In Dr. Green's centennial address, delivered before the Massachusetts Medical Society, last summer, several references to the disease are quoted. The Reverend Mr. Danforth, of Roxbury, during the winter of 1660, makes the following entry in the church records: "The Lord was pleased to visite vs with epidemical colds, coughs, agues and fevers." Later, in 1671, he writes: "This summer many were visited with ye ague and fever;" and again in the same year he records: "Agues and fevers prevailed much among vs about ye Bay, and fluxes and vomiting in Boston." Another writer, in 1691, speaks of the "burning and spotted Fevers, shaking Agues, dry Belly Achs, plague of the Guts, and divers other sore distempers" which afflicted the plantation.

There are other records of the existence of malaria in New England at later periods; but for a considerable time this form of disease has shown itself endemically in but very few sections. It is, we believe, about five years since it began to travel up the Connecticut and along the seacoast. It has now reached some of the river towns in lower Vermont, and has been quite prevalent at several points in Western Massachusetts, along the Connecticut River Valley. Cases have also occurred at Providence, R. I., and in the vicinity of Boston. According to a report made by the Connecticut State Board of Health, the "malarial wave" is gradually extending over that State. The only rule which seems to be observed is that it follows up the river valleys, spreading on either side. It also travels along the coast-line, extending thence inland. Local causes do not apparently develop the disease, although marshy ground, newly turned soil, etc., have in some cases increased the amount or modified its character.

What is the cause of this remarkable spread of malaria in a region that had so long been almost entirely exempt from such visitations? The Connecticut Board of Health is studying the question, and the sanitary authorities in other States will doubtless join in the investigation. Medical men in all parts of New England will do well to collect any facts which are likely to be of service in the examination.

"I HALF agree with you," said old Piper Heidsick to the homœopathic doctor. "It is just as you said just now, — '*similia similibus* decanter;' but I prefer larger doses than you give in your school."

SURGICAL OPERATIONS BY MACHINERY.

In the progress that has been made in superseding hand-labor by machinery, the domain of the surgeon has at last been invaded. The skill of the inventor has long been taxed in furnishing improved instruments for surgical operations, and now Dr. W. G. A. Bonwill, of Philadelphia, has devised a machine to take the place of the hand in the management of these ingenious tools. It is a decided advance, both in the comprehensiveness of the machinery and its varied applications, over anything which has preceded it.

The apparatus has been for some time in use in several of our principal Eastern cities, where it is received with much favor by leading surgeons. Quite recently it has been brought to the attention of English surgeons, at the International Medical Congress, and a London journal comments upon it as follows: —

"Our American friends have always been foremost in devising mechanical appliances for superseding manual labor, and Dr. Bonwill's is the latest which has been brought under our notice. Besides saving labor, the present machine tends to redeem from something of barbarism certain surgical operations, particularly amputations. As well as being the latest addition to the list of labor-saving appliances, it is, perhaps, the most startling, inasmuch as the amputation of a limb may now be effected by the aid of machinery.

"The surgical engine of Dr. Bonwill consists of an iron standard carrying an arrangement of multiplying wheel gear, which, by means of an endless cord passing over pulleys, transmits rapid rotary motion to either small drills or very fine circular saws, as the case may be. These instruments are attached to the end of a series of rods connected by universal joints, which permit the operator to move the cutting instrument in any direction he pleases while it is revolving at an incredibly high speed. It will of course be understood that these instruments are intended to deal only with bone. Thus with the drill, it was shown that in cases where it is desired to hold the parts of a fractured bone together in a certain position, holes can be drilled and pins inserted, which, being held in a steel frame, keep the parts exactly in position. With the circular saw it was demonstrated that pieces of any required shape can easily be cut out of and removed from a bone, or a bone can be cut through in a few seconds.

"For amputations, a small, straight saw can be used. It is simply fitted into the holder, and as it is attached to a small eccentric worked from the main gearing it has a very rapid reciprocating action imparted to it when the gearing is put in motion, which is done by means of a small hand-wheel. The comparatively slow movement of the hand of the operator is here replaced by the inconceivably rapid motion of the mechanical saw. By this means not only is the time occupied in the operation greatly shortened, but the operation itself is much more neatly performed, owing to the smallness of the cutting instrument and the high speed at which it is moved.

"Dr. Bonwill is certainly entitled to the thanks of the medical profession, and no less those of the suffering public, for having dedicated his invention to their free service."

THE SPIDER AS AN ANTIPERIODIC.

A WRITER in the New York *Medical Record* recently gave some facts which seem to show that the web of the common spider possesses antiperiodic properties. This has drawn forth the following curious communication from a Canadian correspondent of the same journal: —

The paragraph headed "The Spider's Web as an Antiperiodic" brought to my mind the story told me by a sailor, who, in the course of his journeyings to and fro upon the Lakes, had frequently to pass through the Welland Canal, which runs through a very malarious district; and upon almost each occasion he found himself possessed of — if not of a devil, at least a cousin-german — an ague, much to the detriment of his health, as well as of his exchequer, by the purchase of that potent but high-priced exorciser, quinine.

On one occasion, while dining at a canal-side hostelry, he became possessed of his old-time enemy. A friendly sailor, on inquiring what was wrong, informed him that he would cure him within an hour, and that so effectually that he would *never* have another seizure.

His remedy was near at hand and inexpensive, for, after a cruise around the room, he returned with a lively specimen of the common house-spider, which was to be taken as a living sacrifice to eternally appease that great Goddess of the Shakers, malaria. He stated it was important you should follow out the directions: —

You first catch, not your rabbit, but your spider, place it carefully in the palm of one hand, and with the fingers of the other gently manipulate him or her (both sexes being, I believe, efficacious) until the legs are well tucked in, and it assumes a pill-like shape, when all is ready for *le grand coup*, namely: swallow it *alive* with as good grace as you can muster. My informant stated that the dose made him feel rather sick, but that he began to feel better in half an hour; that from that day to this (some years) he has never had an attack of the ague; and that it has proved equally efficacious with many others. If two grams of the product of the spider (spider's web) can cure an ague, how much more efficacious should the swallowing of the whole manufactory be?

Is it not quite possible that the family of the Arachnids may secrete some virus that is antidotal to the poison of malaria? If so, it will merely become a question with the sufferer whether he prefers his ague to this heroic insectivorous remedy.

PSYCHOLOGY IN MEDICINE.

THE following, from the London *Lancet*, will be of interest to the more thoughtful of our readers: —

We sometimes hear of men who claim to take or leave the study of psychology at pleasure. They might as well affect to treat histology, or physiological chemistry, as a separable part of medicine. Humanity is suffering from the arbitrary relegation of what are called "mental diseases" to the care of a specialty. It would be as reasonable to refer the pathology of the secretions to one class of practitioners, while another took charge of the organs by which these secretions are elaborated! How could the organs be studied or treated without regard to their functions and work? And how, we may ask, can the body be studied or treated apart from the mind, in and through which it is often possible to gain the best, or only, view of its inner workings? We are not speaking in any metaphysical sense, but practically. It is time to put in an earnest plea for the recognition of psychology as an intimate part of physic. Every advance we make in the exploration of nature renders it increasingly evident that body and mind are inalienable, — as in health so in disease. The mental phenomena of life are the direct effects or the reflexes of the physical state. It is therefore obvious that the moment is approaching when the recognition of unity must be conceded.

We are not now speaking of unity of ultimate constitution. Of the mysterious *something* which makes man more than an animal, science knows nothing. Those of its professors who worship "the Unknown" confess that the object of their faith stands outside the confines of human intelligence. At the same time they claim to recognize, and ask the most crudely — or may we borrow Dr. Hughlings Jackson's emphatic word, and say *brutally*? — materialistic of physicians to recognize, the effect which the outer centring of human hopes and aspirations must have on the psychology of man's nature. Even if human emotions be the outcome of viscera, they are generally affected by the manner and the real or supposed object of their exercise, and they react on the viscera from which they spring with a force and an intensity due to the outer sphere in which they operate. It follows that this outer sphere — the *spiritual* — must be recognized by the physician in his dealing with the mental and physical constitution of man as a whole. In short, the whole range of psychology must be included in the province of practical physics.

PHYSIOLOGICAL ACTION OF STRYCHNINE.

Strychnine affects animals differently according to the state they are in as regards nutrition. Thus, according to recent experiments by M. Delaunay, the same dose being given to a large and vigorous frog as to a small, weak one, the phenomena of poisoning are much more rapid and intense in the former (in case of recovery, it recovers more quickly). A frog always well fed is much more sensitive than one that has fasted several weeks. In frogs the right side is most developed, and after injection of strychnine is the first and more gravely affected. Of two similar frogs receiving the same dose of strychnine, but one of which has been walking and leaping half an hour, this one is sooner and more severely affected. The same holds in general for exercise or stimulation of any part of the animal; and a frog forced to exercise after poisoning is sooner affected than another at rest. A frog suspended by the hind-legs is thrown into convulsions by a given dose of strychnine twenty minutes before a similar frog hung by the head and receiving the same dose, and the convulsions are much more violent. M. Delaunay thinks the horizontal position may be a cause of death in persons poisoned by strychnine, and suggests keeping them vertical as better. Again, a frog previously weakened by bleeding is less rapidly and gravely poisoned with strychnine than one that is intact, and bleeding helps recovery. Lastly, a congested limb is more sensitive to poisoning than one not congested.

THE TREATMENT OF BURNS.

The London *Medical Record* says that Dr. J. Troizki, in a Russian medical journal, adds his testimony to that already published as to the value of solution of bicarbonate of soda as a dressing for burns. He says that during the previous year he noticed twenty-five cases of burns, mostly of a severe nature. Sixteen of them were received in a fire in a village, during a strong wind, when the inhabitants, in order to save their property, were obliged to work in the flames. In all these twenty-five cases bicarbonate of soda was exclusively applied. The result of this treatment was so favorable that the author considers himself justified in pronouncing this remedy the best and most efficient in burns of all kinds and degrees. Even in extensive burns of the second and third degrees, the pain was soon alleviated by the application of compresses soaked in a solution of bicarbonate of soda; and the wounds soon healed, leaving but few scars, and no impairment of the functions of the affected parts. No evil results from this extensive use of bicarbonate of soda, which might suggest the reception of carbonic acid into the blood, were noticed.

As regards the application of bicarbonate of soda in burns, the author distinguishes three methods: (1.) Powdered bicarbonate of soda is strewn over the burned parts. (2.) Linen rags, sprinkled with a solution of bicarbonate of soda (1 in 50) are laid on; as soon as these rags become dry, they are replaced by others, or are moistened again in the solution. (3.) Linen rags are applied in the same manner, but are kept constantly upon the burns, and moistened by pouring the solution over them. The first method suffices only for burns of the first degree. Change of the moistened rags is chiefly adapted for burns of the third degree, attended with much suppuration. In exchanging the dry rags, the pus which has accumulated underneath them must be carefully washed off, that it may not be received into the blood; and then a fresh rag soaked with the solution must be placed upon the clean granulating surface. The third method is applied solely in burns of the second degree. Changing the compresses would in these cases only irritate the exposed surface, and, by causing a more copious suppuration, delay the healing process. The beneficent effect upon burns of the solution of bicarbonate of soda the author considers to be due to the anæsthetic, antiseptic, and disinfecting property, which the bicarbonate owes to the ready disengagement of carbonic acid from it. Herr Troizki has also made experiments with other antiseptic and disinfectant agents, but has come to the conclusion that none are so useful as the soda.

MISCELLANEA.

Cottage Hospitals as Memorials to Garfield. — We heartily endorse the following, from the *American Architect:* Among the innumerable propositions which are made in the newspapers for perpetuating the name of our late President, the most popular one appears to be that which contemplates the establishment of hospitals bearing the name of Garfield, and endowed in such a way as to rank with the best of their kind. Whatever the American people undertake they are likely to carry through, and it is worth considering whether, in the present state of knowledge, more good might not be accomplished, and the name of the eloquent and upright Garfield kept quite as much in mind, by dedicating to his memory, not a few vast city establishments, but a much larger number of cottage hospitals, which, scattered through the towns and large villages of the country, would be of incalculable value. In manufacturing towns, particularly, where a large part of the population is often crowded together under conditions which would hardly be tolerated in the worst streets of New York, some such public charity is urgently needed; while even in the remoter country districts a careful inquirer will often hear of instances where whole families have been swept away by outbreaks of contagious disease, which might have been confined to a single case if means of isolation and rational treatment had been available. The requisites for securing this are simple and inexpensive. A thoroughly clean, sunny building, carefully heated and ventilated, with accommodations for a nurse or two and a modest provision for medical attendance, would do far more, in any village of four or five thousand inhabitants, to restore the sick to health, and protect the well from needless attacks of disease, than could be accomplished by contributing the money which it would cost toward the erection of a huge city or state structure; and for the present, at least, the country districts are far more in need of such charities than the towns.

Death from the Use of Anti-Fat. — Much excitement has been caused in Northern Ohio over the recent death of the wife of C. R. Griggs, lessee of the Wheeling and Lake Erie Railroad, said to be caused by using the medicine known as "anti-fat." The following are given as the facts of the case: On the 11th of August, Mr. Griggs and his wife engaged a suite of rooms at a hotel, both being, apparently, in perfect health. On the morning of the 13th a servant, entering her room, found her lying in a swoon on the floor. A doctor was summoned, but all his efforts to bring her out of the comatose state into which she had fallen were fruitless for a long time. Mr. Griggs finally telegraphed for Dr. Soss, of New York, the family physician. For awhile both doctors were puzzled, and pronounced the case one of erysipelas. Mrs. Griggs was very stout, and Dr. Soss, learning that she had been taking an anti-fat medicine, began treating her for blood poisoning. In her lucid moments she told Dr. Soss she had taken eighteen bottles of the anti-fat medicine in ten months. Recently she became ill, and had discontinued its use. Once before Mrs. Griggs was taken sick after using this medicine, and the doctor, after great trouble, succeeded in giving her relief. He told her that the continued use of the medicine would certainly cause death, and supposed she had stopped using it. The combined efforts of both physicians to save Mrs. Griggs's life were of no avail.

Singular Attempt at Suicide. — The *Siècle Médicale* reports a very curious case (if not a hoax) of a man who, after altercation with his wife on a question of supplies, determined to rid himself of his troubles and his life. He placed the point of a poniard vertically on the top of his head, and with a hammer drove it up to the hilt. A physician was called, who found the patient perfectly intelligent; he made the most forcible attempts to withdraw the poniard by pulling on the hilt, but without success. He called in M. Dubrisay, and both renewed the attempt with the same result; the poniard was so firmly fixed that it could not be moved. The party finally adjourned to a neighboring machine-shop, and the handle was fixed in a sort of vise worked by steam, so that a uniform traction was brought about, and the instrument finally withdrawn, with the point somewhat bent. The patient immediately stood up and began to talk; he presented subsequently no paralytic or inflammatory symptoms.

Poisonous Perfumes. — Various cases of poisoning from the use of perfumes have been reported in recent English journals. In one instance a little girl had bought some heliotrope perfume at a bazar, and had applied it on her face. This caused a vesicular eruption, swelling, itching, and in fact erysipelas, which lasted for some time. The scent was made with some of the products of coal tar, and not with the odoriferous principles of plants, thus acquiring its irritating properties.

Pharmacy in Germany in 1555. — Before pharmacies were thought of, the dispensing of medicines was in the hands of the clergy. One of the first pharmacies was in Halle (Prussia). It still exists, and is known as the Lion Apotheke. It was established in 1555 by Wolf Holzwirth, under the patronage of Archbishop Sigismund, which dignity prescribed at the same time a kind of prohibitive law for the inhabitants of Halle, which ran as follows: Be it enacted, that no one in our town of Halle openly or secretly prepare or sell confections, tablets, ointments, plasters, fats, or things made with sugar, such as simplicia or composita, decoctions, tiriac, colloquintida, or other substances which belong to the exclusive privilege of the apothecaries.

Darwinism and the Extinction of Great Men. — Dr. Jacoby has recently published a new book, entitled, "Etudes sur la Sélection dans ses Rapports avec l'Hérédité chez l'Homme." It gained the prize offered by the Madrid Royal Academy

Medicine in 1874 for a work on the hereditary influence of selection upon the human race. It may be doubted, however, whether the book can be correctly described as a contribution to Darwinism. Darwin's theory is essentially that of the survival of the fittest and the gradual evolution of higher types, including man himself, from lower organisms. But Dr. Jacoby gives a very appalling explanation of the reason why there are no more Homers and Shakespeares, and one which scarcely seems to harmonize with the theory which evolves the brain of man from the tip of a plant radicle. In brief, Dr. Jacoby's conclusion is that whenever any member of a (human) family becomes illustrious, that family pays by rapid degeneracy and ultimate extinction for the (comparatively) momentary *éclat* acquired. Humanity hereafter will not be the posterity of the powerful, the rich, the intelligent, the learned, the energetic, but of laboring peasants, necessitous *bourgeois*, humble and little people. The future belongs to physical mediocrity; every conquest of intelligence hastens the extinction of the race, and the school board is the precursor of a depopulated world.

ORIGIN OF YELLOW FEVER. — Dr. Manuel Da Gama Lobo, of Rio Janeiro, physician to his Majesty the Emperor of Brazil, has been prosecuting some microscopic investigations relative to the land origin of yellow fever. He has found at Vera Cruz, Mexico, and Havana, Cuba, sufficient evidence to warrant him in stating that these localities are fruitful sources of a poison which causes the disease. The toxic agent is derived from a species of infusoria, the *opunsia Mexicana*, which belongs to the family of *bacillæ*.

THE OLDEST INHABITANT. — Joseph Martinho Coutinho, of Cape Frio, Province of Rio de Janeiro, Brazil, is reported to be nearly one hundred and ninety years of age, having been born, it is claimed, in 1694. He is said to be the ancestor of 42 children, 123 grandchildren, 80 great-grandchildren, and 20 great-great-grandchildren. Like all those old gentlemen who have passed their first centennial, Senhor Coutinho undoubtedly gets up at four in the morning, delights in chopping wood by the cord, breaks in restive horses, walks twenty miles without the slightest fatigue, and is blessed with a fine appetite, good eyes, and the best of health. Born in 1694, — George Washington's nurses will have to hide their diminished woolly heads.

FORMULÆ AND RECIPES.

AROMATIC CACHOUS. — The *Canada Pharmaceutical Journal* gives this recipe:

Take of

Extract of licorice root	100 parts.
Dissolve in warm water	100 "
Add powdered catechu	30 "
Gum arabic	15 "

Evaporate in a warm bath to an extract, adding

Cascarilla bark	2 parts.
Vegetable charcoal	2 "
Orris root	2 "
Mastic	2 "

And when nearly cold add

Peppermint oil	2 parts.
Tincture of ambergris	10 drops.
Tincture of musk	10 "

Cut the mass into pieces of a suitable size and shape. These will of course be black or dark-colored. It has recently been noticed that thymol has a powerful deodorizing effect on tobacco smoke.

CALAMINE LOTION. — The following is the formula prescribed by the late Dr. Tilbury Fox: —

Levigated calamine	40 grains.
Oxide of zinc	20 "
Glycerin	20 minims.
Rose-water	to 1 ounce.

The main point is to get the white calamine, and not the red. It is a very soothing application, and is a great favorite with ladies who have flushed faces. It should be applied with a small, soft sponge, and allowed to dry on, the excess of powder being lightly dusted off with an old pocket-handkerchief.

ERGOT IN THE TREATMENT OF SEA-SICKNESS. — Dr. T. S. Hopkins, of Thomasville, Ga., writes in the *Medical News* very enthusiastically in regard to the value of ergot for the relief of sea-sickness, from personal experience in a passage from Philadelphia to Savannah. He considers the following formula preventive as well as curative: —

Ext. ergot fl. (Squibb's)	f. ʒ ss.
Potass. bromid.	ʒ ss.
Aquæ	ad ʒ vj. M.

Sig. ʒ ss. two or three times a day.

FUMIGATION IN ASTHMA. — The following is a celebrated London "anti-asthmatic powder:" —

Potassii nitratis	
Pulv. anisi	each, ½ ounce.
Pulv. stramon. fol.	1 "

A thimbleful of the powder, placed on a plate, is pinched into a conical shape and lighted at the top. It is then held near the patient, who inhales the fumes.

CARBOLIC POWDER. — A dry powder, containing a definite quantity of carbolic acid, in which form the latter is most easily used as an antiseptic, is prepared, according to a Berlin journal, as follows: 60 parts of rosin and 15 parts of stearine are melted together with a gentle heat, and when the mass has somewhat cooled, but is still liquid, 25 parts of carbolic acid are added. The mixture is then mixed with 700 to 800 parts of precipitated carbonate of calcium, and by careful trituration reduced to a uniform powder. This is to be applied by means of a sprinkling-box, which may be securely covered after use.

The powder may be applied either directly to wounds and sores, so as to produce an antiseptic scab, or it may be used for the extempore preparation of carbolized jute dressing by placing several layers of jute, each separately dusted over with the powder, upon each other.

FACETIÆ.

THE ERA OF "PADS." — The *New York Times* thus pleasantly touches up one of the most successful, though most transparent, of the humbugs of the day: —

"Since the original liver-pad inventor made a fortune by decorating the fences of our country with his half-length portrait, representing him as dressed almost exclusively in a liver pad, the attention of inventors of remedies for all sorts of diseases has been turned to the exterior of their fellow-beings. Pads have to a great extent superseded 'bitters' and 'compound extracts' and 'favorite remedies,' and the inexhaustible supply of eminent though anonymous ministers of the gospel, who were formerly constantly testifying that they had been cured of incurable diseases after taking seven bottles of this or that medicine, are now devoting most of their spare time to writing letters declaring the miracles wrought in the condition of their various organs by wearing appropriate pads. There is not an organ in the possession of any human being which is without its special pad, and persons who fancy themselves afflicted with a complication of diseases frequently cover themselves so thoroughly with remedial pads that they could with entire decency appear in public without any of the garments usually held to be necessary."

"UNCLE WILLIAM'S PILLS." — A little girl came into a drug store and asked for five cents' worth of "Uncle William's pills." The druggist could not make it out, so he sent her away; she returned soon afterwards, and said, "Mother said 'Aunty Billy's,' but I thought it could n't be right."

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Boston Journal of Chemistry
AND
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Familiar Science.

OUR SWEETS: GLUCOSE.

IT cannot be a mere matter of chance that substances used as foods by men and animals are some of them sweet and others acid, or that some are sweetened with sucrose (cane sugar), others with glucose (grape sugar), and still others with levulose (fruit sugar). There is a wonderful adaptation of means to ends throughout nature. The sweet sensation is generally agreeable, as has been before stated, but it must be modified and adjusted, else it would become repulsive. If our fruits were all sweetened with pure cane sugar in differing proportions, they would lack a certain zest, due to a peculiar sweetness which they now possess; or, if our grapes did not form an exception to other fruits in the method of sweetening, they would not be the delicious fruit so universally esteemed. Apples, pears, peaches, and most other fruits are sweetened with levulose, or what may be regarded as a mixture of sucrose and glucose; and differing varieties hold unlike proportions, giving in conjunction with malic acid and certain essences the nice shades of flavor observed. The manufacture of sugar is not set up in fruits until the period of maturity is nearly or quite reached, and then the process is usually a gradual one.

The grape vine and fruit do not possess the power of grouping the atoms of hydrogen, carbon, and oxygen so as to form molecules of sucrose; the result of their work is confined to glucose. Hence a grape is never excessively sweet, or it does not reach a degree of sweetness beyond what glucose can furnish. If a grape were a solid mass of sugar it would not be very sweet, as the sugar is incapable of conveying to the taste any intense sensation. Every one who has tasted old or well-dried raisins has observed the hard lumps of sugar which frequently form, of considerable size, under the skin covering. These are lumps of glucose which result from the evaporation of the moisture in which it was held in solution in the grape. These lumps are deficient in sweetness, as has been observed from the earliest times. If this substance was supplied in large quantities from grapes or raisins, it would sell at a low price in the market. If a grocer sold it for pure sugar (cane sugar), it would probably come back to him again, and he would rightfully be charged with fraud. No shrewd dealer or manufacturer would sell it by itself as sugar, but those dishonest in the trade would mix it with cane sugar, and thus dispose of it with less risk of exciting suspicion. This is now a form of fraud of enormous magnitude, as will be presently shown.

During the wars of Napoleon I., early in the present century, he established the famous Continental blockade, by which all products of England and her colonies were excluded from the markets. This of course made sugar scarce and dear in France, and stimulated search for products which might be sub-tituted. The grape crop of France was enormous, and as commerce was destroyed it was useless to make wine; so attention was turned to extracting the sweet principle of grapes. Syrups and sugars were made from grape juice in large quantities, and Napoleon ordered it to be used in the palace as an encouragement to its production. He issued several decrees in regard to its manufacture, and the celebrated chemists of the time, Proust, Berthollet, Parmentier, and others, were kept busy striving to perfect the products. Montalivet, the great minister of the interior in Napoleon's cabinet, in one of his reports, states that it has been ascertained that the grape-sugar equivalent of cane is a little over two and one half to one. This is not far from correct.

Thus it is shown that the chemists of France were making glucose more than seventy years ago from grapes, and if they had known that it could be made as well from potatoes, corn, or any other cheap substance holding starch, the discovery might have retarded the great progress that soon followed in producing cane sugar from beet juice.

It was as early as 1747 that Margraff made his experiments showing that beets contained sugar, but it was not until Achard, the son of a French refugee in Prussia, took up the subject, and published the astonishing results of his researches, that it excited public attention. The difference between the two forms of sugar, that from grapes and that from beets, was easily seen, and Napoleon's attention was called to it by his corps of illustrious chemists. He immediately gave himself to the work of creating and perfecting this new industry, and in 1812 he had the satisfaction of learning from the reports of his minister of the interior that 334 factories in the empire were producing annually 7,700,000 pounds of beautiful cane sugar from beets. This seems almost like the work of magic, and illustrates the greatness of the man whose power was felt in every part of the civilized world.

The early attempts to extract sugar from beets in Napoleon's time were made subjects for fun and ridicule. The Emperor himself did not escape the lampoons of the wits of the age. A caricature was exhibited in Paris, in which the Emperor and the baby King of Rome were the prominent characters. The Emperor was represented as sitting in the nursery with a cup of coffee before him, into which he was squeezing a beet root. Near him was seated the King of Rome voraciously sucking a beet root, while the nurse, standing near and steadfastly observing, is made to say to the youthful monarch, "*Suck*, dear, *suck*; your father *says* it is sugar."

In manufacturing glucose from corn, the process is, first, to separate the starch from the other constituents of the grain, by simple mechanical means; and then, secondly, to act upon the starch with dilute sulphuric acid (oil of vitriol). When thick gelatinous starch is boiled for a couple of hours with this acid, a curious transformation takes place: the milky paste first changes to a fluid as limpid as water, and as the change advances this acquires a sweet taste, which is masked by the presence of the acid. If we now saturate the solution with some earthy carbonate, marble dust for instance (carbonate of lime), the acid is removed, and a sweet solution remains, which, after purification, may be evaporated to a syrupy liquid, or by still further manipulation converted into a white solid, which is grape sugar. This is the whole process for making "sugar out of corn," and it is simple enough. In this chemical transformation nothing is absorbed from the air, and no other substances but dextrine and grape sugar are generated, and the weight of the sugar exceeds that of the starch employed. What is still more wonderful, the acid used undergoes neither change nor diminution; it is all withdrawn in its original amount after the boiling is completed. If it could be withdrawn in its clear, uncombined state, one carboy of oil of vitriol would serve to change all the corn grown in the United States into grape sugar. Theoretically, one pound of corn ought to make a pound of solid glucose, but in practice it does not quite do this. The cost of solid glucose to large manufacturers cannot exceed three cents a pound, and it may fall considerably below this.

Nothing can be more paradoxical to the popular reader than the statement that sugar is produced by the use of one of the most powerful mineral acids known to chemists. To explain clearly and fully the chemistry of the reactions involved in the process would require more space than we have at command; and also, to

understand the nature of the changes, more scientific knowledge would be required than is possessed by ordinary readers.

Glucose is a cheap, imperfect substitute for the genuine sugar of commerce. It is not a poison when well made, and, as regards its healthfulness, it may not be much more deleterious than ordinary cane sugar. Still, it does produce and aggravate dyspeptic symptoms, and by its proneness to set up fermentative processes its use causes flatulency and painful affections of the bowels.

What becomes of the millions of pounds of glucose manufactured in the Western States every month? It is used mostly as an *adulterant* in the manufacture of table syrups, and in adulterating the dark, moist sugars used largely by the poor. Its next largest use is in the manufacture of candies. All soft candies, waxes, taffies, caramels, chocolates, etc., are made of glucose. Children are therefore large consumers of this substance; the honey bees, also, are fond of it, and will carry it away by the ton, if placed within their reach. The honey made from it is no better than the pure glucose, as it is stowed away in the comb without change. Human ingenuity, it is stated, has reached the point of making honey and storing it *in the comb* without the mediation of the bee; therefore we can now dispense with its services. By appropriate machinery a nice-looking comb is made out of paraffine, the cells being filled with glucose syrup, and this factitious honey is warranted true white-clover honey from Vermont.

The beautiful clear white syrups found on our breakfast tables, and used as an agreeable adjunct to our waffles and buckwheats, are largely composed of glucose. A mixture of true "sugar-house" syrup with glucose syrup, in proportions of five or ten per cent. of the former to ninety or ninety-five per cent. of the latter, constitutes the high-priced "maple drip" of the grocers. A Western chemist reports the results of recent analyses in which adulterations amounting to from five to fifteen per cent. of glucose were found in various popular brands of sugars.

In this brief consideration of the nature and uses of a comparatively new article of manufacture, the astonishing fact is disclosed that this year more than 12 million bushels of corn have been manipulated to produce an article employed almost exclusively as an *adulterant* to one of the most common and important constituents of food. It is a reprehensible form of fraud, and should be arrested by laws similar to those which govern the sale of the "oleomargarine" compounds. Every package of this sugar should be stamped *glucose*, and sold as such; and every mixture made with it should be accompanied with a statement, stamped upon the vessels which hold it, giving the exact percentage of glucose contained in the adulterated sugar or syrup. A law similar to that which is found on our statute books regulating the sale of fertilizing compounds would be effective, if energetically enforced. The loss to purchasers in the glucose syrups is enormous, as the quantity required to sweeten substances is at least twice as great as when cane sugar is employed, and the use of this quantity of the agent renders it deleterious to health. The attractive appearance of the syrups, which are white and clear, gives them a wide sale at high prices, and all consumers of sweets in the country are victims to a form of fraud which deserves the prompt attention of our law-makers.

CURIOSITIES OF MODERN ELECTRICAL SCIENCE.

ELECTRICITY is being applied to so many strange purposes, nowadays, that we are not easily astonished by any report of a new use of the agent or a marked extension of a former use. The "unexpected" is what is continually "happening" in this department of modern science. The wildest dream of to-day may become the sober reality of to-morrow. The most preposterous hoax of some waggish "foreign correspondent" may be converted into plain fact by a fresh discovery or invention, or thrown quite into the shade by something that would seem more preposterous if it were not well authenticated. Scientific hoaxes are nevertheless not impossible in this day of startling developments that verify the old adage concerning the relative strangeness of truth and fiction. We have recently seen a paragraph copied from the London *Telegraph* by one of our scientific exchanges, describing what is called the "dioscope," a new Parisian invention meant to be used in connection with the telephone, and to enable one to see as well as hear a theatrical performance, without the trouble of being present thereat. The telephonic part of it, which would have seemed little short of miraculous a few years ago, has been successfully effected, as the reader may see by an article in another part of this number of the JOURNAL. A man may sit by his own fireside and listen to speakers and singers in a distant part of the city. But to listen to a dramatic performance without a sight of the actors is to get but half of the entertainment, and the "dioscope" supplements the telephone by photographing the stage before your eyes in your own parlor. A little mirror set in the wall of the room is connected with the theatre by electric wires which transmit a reflected picture of the shifting scenes to the polished surface, so that you are a spectator as well as an auditor, and enjoy the complete dramatic effect while reclining in your easy-chair at home.

This is described as actually perfected and accomplished, though it has probably been carried out only in the fertile brain of the penny-a-liner who reports it. It is evident, however, that it was suggested by the experiments which have been made in reproducing images of objects by the electric wire; and that these may some day lead to results as surprising as our imaginative scribbler has fancied is by no means unlikely. Far stranger things have already been accomplished, and the "dioscope" or its equivalent may become as familiar as the telephone before the scientific achievements of this nineteenth century are complete.

Dr. Siemens's experiments with vegetation under the electric light are possibly destined to bear fruit in a literal sense. He is still continuing his investigations, begun a year or more ago, with lamps of four thousand candle power each, connected with an engine of six horse power. The first trials were not very satisfactory, apparently on account of the excessive brilliancy of the light; and artificial clouds of steam and screens of translucent or colored glass have been interposed with promising results. The cost of the process is only at the rate of twelve cents a night for five thousand candles, and Dr. Siemens is confident that it will yet become a common means of forcing the growth of vegetables for market. Some of the details of his experiments may hereafter be made the subject of a separate article.

Among the minor applications of electricity to practical purposes, one of the most curious we have lately noted is its employment in the hiving of bees when they swarm. Some German scientist conceived the notion of utilizing the electric force to stupefy, without injuring, the bees for a short period. The plan was found to work like a charm. It was first tried upon bees that had gathered upon trees. Whether the clusters were large or small, the result was perfect. The bees fell upon the ground in a trance, which admitted of safe handling. The next stage in the experiment was to capture the bees when they were about to swarm. By introducing the ends of two conducting wires into a fully occupied honeycomb, and turning on the current for an instant, the insects were rendered inactive for half an hour or more. The dose of lightning probably has to be regulated with some care, lest the bees should not recover from the shock.

Equally ingenious is the recent French invention of an electrical apparatus for measuring automatically the rations of oats for horses in large stables. It is thus described in a foreign journal: —

The grain is poured into a certain number of hoppers, whose lower orifice is blocked by a valve fixed at one end of a long lever, which is pivoted near its centre. A heavy counterweight acting on a rod which connects the levers of all these valves tends to stop the orifices, but this action is ruled by an electro-magnetic catch, which yields only when the oats, having fallen into a case supported on a Roman balance, weigh down the balance and close an electric circuit. The motion of the lever-valve effects a second closure of circuit, through a special rheotome, and the valve, once closed, is opened anew. During the closure, the case into which the oats fall is tilted, and pours its contents into a receiver below, which is then withdrawn for distribution. A mechanical stirrer forces the oats to flow into the hoppers.

Franklin brought down the lightning from heaven, and taught us how to control its destructive tendencies; and now we make it feed out oats to the horses in our stables and gather the swarming bees into our hives. It may not be long before we shall compel it to wash dishes and do similar drudgery in our kitchens, and the "servant-girl problem" may be solved by the introduction of automatic electrical "Biddies," warranted to work without a jar or a "blow-up."

EXPERIMENTS FOR YOUNG CHEMISTS.

BY PROF. E. J. HALLOCK, PH. D.

III.

NITROGEN.

THE simplest method of obtaining nitrogen is from the air, by removing the oxygen. Place a piece of dry phosphorus as large as a pea in an inverted wooden match-box lid, and float it in a basin of water. Touch a hot wire to it, and cover quickly with a beaker glass or bell jar.

Instead of a floating support, a stand like that shown in Figure 3 may be made from the stem

Fig. 3. Preparation of Nitrogen.

of a broken wine glass or goblet. The jar is soon filled with white fumes of phosphoric anhydride, P_2O_5, which are so dense as to obscure the intense light of the burning phosphorus. In a short time they will have dissolved in the water, which will rise in the jar two or three inches. Slip a plate of glass under the jar, so as to lift it from the water, and turn it over. A lighted taper is extinguished when put into this gas, which proves that it is not oxygen; the gas itself does not burn, which proves it is not hydrogen. Nitrogen is negative in all its properties.

Since four fifths of the atmospheric air consists of nitrogen, we should expect to find that only one fifth of the air in the jar had disappeared, leaving four fifths behind. This is not the case in this experiment, because the heat expanded the air and caused a portion of it to bubble out from beneath the jar. Put another piece of phosphorus in a test tube, and melt it by pouring hot water on it. While soft insert in the phosphorus one end of a copper wire. When cold it may be taken out, and the other end of the wire inserted in a small block of wood, so as to hold the phosphorus ball five inches above the table. Place the block in a dish of water, and invert a wide test tube of air over it. By slow oxidation phosphorous anhydride, P_2O_3, is formed, the oxygen gradually disappears, and in a few days one fifth of the test tube will be filled with water. If another test tube is loosely filled with copper turnings and inverted over ammonia, the oxygen will combine with the copper, and the liquid will rise in the tube as before.

NITROUS OXIDE.

Nitrous oxide, N O, is made by heating ammonium nitrate, NH_4NO_3. The same apparatus may be employed that was used in making oxygen, but the gas should be collected over *warm* water, as it is soluble in cold water to a certain extent. The formula for its preparation is, $NH_4NO_3 +$ heat $= N_2O + 2\ H_2O$.

It resembles oxygen, and will reignite a glowing splint; a taper burns in it with brilliancy.

Fig. 4. Preparation of Nitrous Oxide.

The specific gravity of any simple gas, referred to hydrogen, is equal to its atomic weight. From this we learn that oxygen is sixteen times as heavy as hydrogen, while nitrogen is only fourteen times as heavy. To find the specific gravity of a compound gas, like N_2O, we divide its molecular weight by two.

2 Nitrogen	28
1 Oxygen	16
N_2O	44

Nitrous oxide is twenty-two times as heavy as hydrogen. The formula N_2O tells us that two volumes of nitrogen gas are combined with one volume of oxygen gas, and yet the compound occupies only two volumes. If we should remove the oxygen from a given volume of nitrous oxide by means of burning phosphorus or sodium, we should have as much nitrogen left as we had of the gas at the start, but it would weigh less.

One liter of hydrogen gas weighs 0.0896 grams; hence one liter of nitrous oxide weighs twenty-two times as much, or 1.97 grams. Since 80 grams of NH_4NO_3 will make 44 grams of N_2O, one gram of the former will yield 0.55 grams of the latter, or about 280 cc.

NITRIC OXIDE.

This gas, NO, is made by the action of copper upon nitric acid. As no heat is required, it can be made in the same bottle that was used for preparing hydrogen.

Place some strips of copper in the bottle, cover them with water, insert the cork, and pour in a

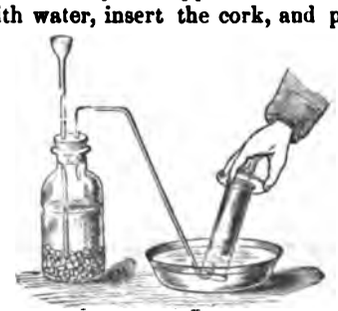

Fig. 5. Preparation of Nitric Oxide.

little strong nitric acid, HNO_3. The reaction is as follows: $3\ Cu + 8\ HNO_3 = 3\ Cu(NO_3)_2 + 2\ NO + 4\ H_2O$. Collect over water, taking care not to inhale it. On coming into the air, or in contact with pure oxygen, it forms dense red fumes, which are a mixture of N_2O_3 and NO_2. It does not form red fumes with nitrous oxide, and hence serves to distinguish between nitrous oxide and oxygen. Some substances will burn in nitric oxide, while others will not. A candle that has just been lighted is extinguished in nitric oxide, but when burning strongly it is able to decompose the gas, and burns in it. If a few bubbles of oxygen are passed into a jar of nitric oxide inverted over water, red fumes are noticed; but they soon dissolve in the water, which rises to occupy the space left vacant.

THE VALI AND THE LIGHTNING-ROD.

Spiridion Gopcevich, in his amusing book upon Upper Albania, accounts for the dilapidated state of Scutari Castle by the following narrative, the authenticity of which he guarantees: —

In the spring of 1874 the Vali of Scutari happened to hear that a hundred years or so ago a Giaour named Franklin had invented an instrument by the judicious use of which lightning strokes might be rendered harmless to human life and property. Forthwith he resolved to become possessed of one of these wonder-working contrivances; but upon inquiring its price he found that the resources of his exchequer would not avail to defray the cost of a complete apparatus. He therefore ordered from abroad the superficial portion of a lightning conductor, deeming its subterranean complement of rods superfluous, and when it arrived caused it to be set up exactly over the powder magazine of the castle, in order to insure perfect immunity from electrical dangers to the explosive contents of that repository. An unusually long spell of fine weather succeeded the erection of the instrument, much to his excellency's vexation; but at length, one sultry day, heavy clouds gathered rapidly over Scutari, and the exultant Vali, fortunately for himself, hurried down from the citadel to the town in order to watch the effect of the first flash from a window of his serai, commanding a fine view of the lightning conductor. He had not long to wait for a *coup* that surpassed his wildest expectations. A fiery streak darted from the sky, followed by a tremendous concussion, and when the smoke cleared off it was the Pasha's melancholy privilege to behold his beloved citadel in ruins. The Vali's mortification may be better conceived than described, especially when it reached his ears that a leading notable of Scutari, commenting upon the result of his scientific experiments, had observed, "God is great, and the Vali is an ass! He has swallowed the Giaours' dirt, and paid them for it to boot. His face is blackened forever. Allah's will be done!"

HINTS FOR EXPERIMENTS.

Experiment with the Ear. — An experiment illustrating "fatigue" in the sense of hearing (corresponding to fatigue of the retina) has been described by Herr Urbantschitsch. Two tubes are adapted to the ears, and adjusted, so that a given tuning-fork is heard equally on both sides. Now strike the fork strongly, and let it sound a little through one tube; then deaden it somewhat by touching. The ear on that side fails to catch the weakened sound, but on transferring the fork to the other ear, the sound is heard distinctly. If the weaker tone presented be of different pitch from the stronger, it is heard on both sides equally. The failure of sensitiveness in the other case is very transient.

Action of a Magnet on a Tuning-Fork. — On bringing a powerful magnet near the extremities of a vibrating tuning-fork, the attractive force increases the period of vibration, like a supplementary weight attached to one of the arms. In this way (as M. Crova has lately shown in the *Journal de Physique*), the well-known figures of Lissajous projected on a screen may be varied at will without touching the tuning-forks. He employs M. Mercadier's electro-diapasons for the purpose. A supplementary electro-magnet is placed between the arms of the tuning-fork which gives the fundamental sound; and it can be moved by means of a screw in a direction perpendicular to the plane of these. A variety of curious experiments may be made with the apparatus.

Electrical Experiment. — The following simple electrical experiment is described in *L'Electricien*: A small box of pasteboard is closed with a lid of fine glass, on the upper surface of which collodion is applied several times (but not so much as to render the lid opaque). In the box are placed insect forms, made of sponge or cotton. On rubbing the collodion surface with dry fingers in dry weather, the insects move about in a curious manner.

Experiment in Crystallization. — The *British Journal of Photography* gives the following pretty experiment with hyposulphite and acetate of soda. The former is capable, if heat be applied, of dissolving in its own water of crystallization: hence it will be easy to prepare a solution with one tenth of its weight of water. If such a solution be prepared and placed in a test-tube, it will, if kept quite still,

remain without crystallization, and will allow another solution — acetate of soda liquefied with one seventh of its weight of water — to be poured upon it without any admixture taking place. If carefully preserved from concussion, the solution will remain liquid; but if a crystal of hyposulphite, held by a thread, be carefully passed through the acetate solution into the hyposulphite solution, the latter will solidify at once, while the acetate remains as limpid as ever. If, however, a crystal of acetate be similarly passed into the acetate solution, the latter will solidify directly. The two kinds of crystals thus formed have very different characteristics.

HOUSEHOLD RECIPES.

FRUIT CAKE. — Take one pound of flour and the same of powdered sugar, three quarters pound of butter, and seven eggs: cream the butter and sugar, add the beaten yolks, then a teaspoonful each of nutmeg and cinnamon, and the whipped whites alternately with the flour; next mix in one half pound currants, one half pound raisins, one quarter pound citron cut in slips, and one glass of brandy.

GOLD CAKE. — Take one pound sugar, one half pound butter, one pound flour, yolks of ten eggs well beaten, grated rind of one orange, juice of two lemons, and one teaspoonful of soda dissolved in hot water.

SILVER CAKE. — Take one pound sugar, three quarters pound flour, one half pound butter, whites of ten eggs whipped stiff; flavor with one teaspoonful of essence of bitter almond.

NEW YEAR'S CAKES. — Take one and a quarter pound sugar, one pound butter, one half pint cold water, three eggs, three pounds flour, one teaspoonful soda dissolved in hot water. Sprinkle through the flour four tablespoonfuls of caraway seeds.

ICING FOR CAKE. — This is made by breaking the whites of four eggs into a broad, clean, cool dish, throwing on a small handful of sugar, and whipping in with slow, steady strokes of the beater. A few minutes later throw in more sugar, and keep adding until a pound has been used. Flavor to the taste.

Practical Chemistry and the Arts.

SAFETY PAPER FOR CHECKS.

To prevent the alteration of checks, many devices have been resorted to, both in the matter of paper and of ink. One firm prints checks with an aniline ink that washes out easily, and any one who attempts to alter such a check loses the printed portion, rendering it worthless. Others have incorporated various chemicals into the paper, such that the reagents employed for removing the ink will cause them to react upon one another. Some of these are quite ingenious. One process of making safety paper consists in mixing zinc sulphide with lead carbonate, two white insoluble powders, which may be printed upon the check or incorporated into the paper pulp. When either an acid or alkaline solution or a cyanide is applied to remove the ink, it is assumed that the two metallic salts will react upon each other in such a manner as to form a lead sulphide which is black, and the check will exhibit a black stain. According to the *Paper Trade Journal*, the paper will be blackened by the use of sulphuric acid which is very strong or very weak, but with acid of a certain strength (not given, for obvious reasons) no blackening results, because lead sulphate is formed, and this is white. On the other hand, alkaline solutions produce a brown coloration; but this may be prevented by the addition of a proper proportion of sodium bicarbonate. So much for this safety paper.

Another kind of safety paper has incorporated into it the chemical constituents of black ink, so that the writing may be done with a pen dipped in water. Such paper of course blackens wherever it gets wet. The paper is first saturated with a two per cent. solution of a salt of iron for ten minutes, and then thoroughly dried. Dry tannin, alone or mixed with flour and carbonate of soda, is then rubbed on to the paper. The operation may be performed in reversed order, by first incorporating the tannin into the paper, and then applying a dry salt of iron mixed with flour and sodium carbonate. The patent on this paper claims to cover a paper which has the property of producing or developing dark lines or marks when moistened, that is, having within it the elements of ink. Iron and tannin, or its equivalent, are alone mentioned, but it is evident that other chemicals can be combined in a similar manner.

Not long since we had sent to us for examination a white powder said to be intended for the preparation of safety-paper. It consisted essentially of potassium ferrocyanide and sodium carbonate. It was probably intended for a dusting powder to be applied to paper that had been saturated with an iron salt, thus producing blue ink when moistened.

An English gentleman has invented an ingenious method of printing checks and other documents. The process is thus described in the *Chemists' Journal*: —

Mr. Nesbit has taken advantage of the well-known property of turning red by treatment with acids, and blue by treatment with alkalies, possessed by eosine, litmus, and other dyes. Forgers, as a rule, use either oxalic or some weak vegetable acid, or else alkaline solutions, to effect erasures. In either case detection would be rendered inevitable. According to one method the author uses ordinary paper, and prints on it partly with an acid and partly with an alkaline ink, the same coloring matter being used for both inks. The acid he prefers to use is oxalic acid; the alkalies, bicarbonate of soda and potash, and caustic soda, the strength of the acid or alkali being reduced as required. When a check thus printed is treated with a solution which is alkaline or acid, the whole of the printing is reduced to the same color. Instead of using the same coloring matter for both inks, a different coloring matter may be used for each. According to another method, the author uses paper colored with an acid dye, and prints thereon with a colorless ink containing free alkali or an alkaline carbonate; or he uses paper colored with such a dye made alkaline, and prints thereon with a colorless acid ink: the effect in the first case being to produce an inscription in the color of the alkaline dye, and in the second case *vice versa*. Instead of printing on the stained paper with a colorless ink, an ink colored with the same dye as that used for the paper, or any other suitable dye, may be used.

ANALYSIS OF PHOSPHATES.

To determine the value of a fertilizer, three phosphoric acid determinations are usually made: first, of that in a soluble form; second, of that soluble in citric acid; and lastly, of the insoluble. Dr. Stutzer, in the *Chemiker Zeitung*, proposes to accomplish the second part of the operation as follows. He would digest 5 grams of the substance with 500 cc. of alkaline citrate of ammonia solution, at 40° C. (104° F.); cool quickly; dilute to 1000 cc., filter off 50 cc., and acidify with hydrochloric acid; then oxidize the citric acid with bromine. After making it alkaline with ammonia, he says, the phosphoric acid can be precipitated with molybdate solution as usual. Magnesia mixture cannot be employed.

We have put Dr. Stutzer's method to a comparative test in our own laboratory with the most gratifying results. After treating the phosphate under examination with successive portions of cold water, to remove the soluble phosphoric acid, the residue was digested for two hours with citrate of ammonia, and filtered. The filtrate, which contains the so-called reverted, or returned, phosphoric acid, and an excess of citric acid, was acidified, and then poured into a tall beaker glass covered with a large watch glass, as recommended by Stutzer, and placed on a water bath. A solution of bromine in bromide of potassium, containing an excess of bromine, was then added in successive portions until the liquid retained its yellow color for half an hour. When cold it was neutralized with ammonia, and afterwards acidified with nitric acid, before adding the molybdate solution. Stutzer says that the phosphoric acid cannot be determined volumetrically with uranium salt in this solution.

This method of determining reverted phosphoric acid is to be recommended when it is not required to determine the total amount of acid present; also as a check upon the old method by difference when it is required.

CANNED MEATS AND VEGETABLES.

OTTO HEHNER, F. C. S., publishes in the *Lancet* the results of his experiments, both chemical and physiological, upon the occasional injurious effects of canned goods. He says that tin, even when perfectly pure, is far more readily attacked by food matters than is commonly supposed; it is to be found in comparatively large amounts in an overwhelming majority of canned goods, irrespective of the nature of the same. Acid fruits, such as peaches and cherries, corrode the tin to an appalling extent; but even meats, nay, condensed milk, dissolve and become contaminated with serious quantities of the metal. A can of soup examined contained 35 milligrams (one half grain) of tin to the pound, one of condensed milk 8 mg. (one eighth grain) and one of oysters 45 mg. (0.7 grain), to the pound.

Carbonic acid water, attacks tin, and in all samples of soda-water and other aerated beverages tested, tin was found. The question then arises, Is tin, when taken into the system, injurious to health, or not? This seems to be as yet an unsettled question, but Hehner's experiments on pigs go to show that, while *stannic* compounds are not injurious, tin in a *stannous* condition is a virulent irritant poison, and it is in the latter condition that tin dissolves in the animal or vegetable substances used for food.

ANALYSIS OF SOAPINE.

SOME enterprising firm has recently placed upon the market a washing compound labelled *soapine*. The trade-mark bears a picture of a stranded black whale with a white spot on the side, on which appear the words, "Soapine did it." As the compound referred to seems to be

very popular hereabouts, meeting with a large sale, we have taken the trouble to analyze it, and find that it is a mixture of soap and carbonate of soda in about equal proportions. We give the analysis of soapine and one of good Castile soap side by side for comparison: —

	Soapine	Soap.
Fatty acids	35.0	64.6
Combined alkali	5.2	12.7
Free carbonate of soda	39.5	none.
Sulphate of soda	trace.	none.
Water	20.3	22.7
	100.0	100.0

ANALYTICAL NOTES.

Reduced Iron. — The amount of metallic iron in the so-called *ferrum redactum* may be determined, says Willner, by treating a sample with a hot solution of corrosive sublimate. The metallic iron dissolves as ferrous chloride, and an equivalent quantity of mercurous chloride (calomel) is thrown down. The oxides of iron remain undissolved.

Nitrates in Well Water. — West-Knight makes use of the well-known brucine reaction, substituting for the sulphuric acid a saturated solution of oxalic acid. The determination, says the *Analyst*, is colorometric.

Albumen in Urine. — Esbach proposes to determine albumen in urine quantitatively by the use of picric acid. He dissolves 10.5 grams of picric acid in a liter of water, and then mixes nine parts of this solution with one part of acetic acid, and dilutes it to a specific gravity of 1.040. Of this he adds 22 cc. to the same volume of urine, and heats it in a porcelain vessel on a sand bath. The precipitate is collected on a weighed filter, dried and weighed, and the weight multiplied by 0.8 will give the quantity of albumen in the urine.

Hydrocarbon Oils in Fat Oils. — When coal oil or its products are employed to adulterate fat oils, they may generally be detected by their fluorescence, either alone or when treated with an equal volume of strong sulphuric acid. For the quantitative estimation of such hydrocarbons, Alfred H. Allen saponifies 5 grams of the oil with 25 cc. of an 8 per cent. solution of caustic potash in methylated spirits, boiling it down until it froths strongly. After evaporating the alcohol the soap is dissolved in 70 or 80 cc. of water, and then agitated with ether. The ethereal solution is separated and washed, then carefully evaporated, leaving behind the unsaponifiable hydrocarbon oil, and also cholesterine, if present, as in butter and cod-liver oil.

Cotton-Seed Oil in Olive Oil. — Wm. Rödiger, in a communication to the *Chemiker Zeitung*, states that the presence of cotton-seed oil in olive oil can be detected by saponifying the suspected oil with caustic soda, and extracting the dry soap with benzine, and on evaporating this extract golden yellow drops of unsaponified oil will be seen if cotton-seed oil is present. He thinks that cotton-seed oil contains an unsaponifiable body, because yellow spots are seen in soap made from it, even when an excess of soda is employed.

In the Marseilles public laboratory the presence of cotton-seed oil is recognized by treating the oil with nitric acid. On shaking, a coffee-brown color will be seen if cotton-seed oil is present.

Reducing Substances in Cane Sugar. — J. H. Tucker, in the *Chemical News*, shows that the organic matters in impure sugars have too small an influence upon the results of the copper test to make it necessary to remove them from the sugar solutions before estimating invert sugar.

Washing Filtrates. — We have received from S. J. Hinsdale, Fayetteville, N. C., a new form of tube for the automatic washing of precipitates. It is intended to take the place of the well-known Berzelius wash-bottle. It consists of two glass tubes, one within the other; the longer and the smaller being bent upwards and cemented within the larger, in which is cut an air hole. The method of use is the same as with the old form of wash-bottle.

Detection of Methyl Alcohol. — Cazeneuve and Cotton propose the use of permanganate of potash for the detection of methyl alcohol in common spirits of wine. The former destroys the red color of a dilute (1 per cent.) solution of permanganate very quickly, while ethyl alcohol requires much more time to effect the same change at ordinary temperature.

Passive State of Iron. — Ramann has been studying the phenomenon of passivity exhibited by iron when immersed in concentrated nitric acid, and finds that it is due to the formation of a layer of protosesquioxide of iron, which is quite insoluble in strong nitric acid. Iron in this condition may be used instead of carbon in Bunsen battery cells.

Iron by Hydrogen. — In the reduction of iron by hydrogen, Pillet cools down the vessel in which the gas is generated. He also passes it successively through Wolff's bottles, containing solutions of lead acetate, silver nitrate, and copper sulphate, so to free it from every trace of sulphur and arsenic.

INDUSTRIAL MEMORANDA.

German Tobacco. — *La Presse Médicale Belge* says: "Every year in Thuringia there is consumed a thousand tons of beet-leaves transformed into tobacco. The same leaves, as well as those of chicory and of the cabbage, undergo the same metamorphosis at Magdebourg and in the Palatinate. Vevay cigars are of the same."

Matches. — A German economist has taken the pains to examine comparative statistics concerning the use of matches, and has come to the conclusion that Germany surpasses all other countries in their consumption, which he sets down to the almost universal custom of smoking. In Germany, the daily consumption of matches is from ten to fifteen per head of the population; in Belgium, about nine; in England, eight; in France, six. Their consumption diminishes steadily and naturally from north to south. The total daily consumption for all Europe is estimated at two milliards of matches, which gives an average of six or seven per head. Reckoning the weight of a match at a decigram, this consumption will represent a daily absorption of 200,000 kilograms of wood. So that Europe uses up annually the immense quantity of 72,500,000 kilograms, or more than 80,915 tons weight, of wood in matches alone.

Mica. — The *Railway Herald* says that a valuable mica mine has been discovered about fifty miles west of Cheyenne. Large sheets of mica, clear as glass, are found in large quantities. With the recent advance in the price of mica, this will be welcome news.

Artificial Leather. — Among the recent patents granted at Washington is one for artificial leather, which is a plastic compound for coating articles to imitate leather, etc., consisting of glue, mastic, dextrine, glycerine, chloride of iron, chrome-alum, and a suitable pigment. It is said to wear nearly as well as leather, and costs but half as much. It is used in the manufacture of ladies' fine boots and slippers, and by carriage-makers, book-binders, and upholsterers.

Liquid Sulphurous Acid for Bleaching Wool and Silk. — Professor Pictet has requested silk manufacturers to make experiments with liquid sulphurous acid as a substitute for costly sulphur chambers. A liter of the liquor furnishes 325 liters of the gas.

PRACTICAL RECIPES.

Burning Gold into China. — To dissolve gold for gilding china or glass that has to be burnt, triturate gold leaf in a mortar with a little honey until reduced very fine, then dissolve out the honey with hot water, and mix the gold dust with a little gum water for use; or dissolve the gold in hot aqua regia, evaporate to dryness in a porcelain dish over a hot-water bath, and dissolve in ether for use.

To Keep Machinery from Rusting. — Take one half ounce of camphor, dissolve in one pound of melted lard; take off the scum, and mix in as much fine black lead as will give it an iron color. Clean the machinery, and smear with this mixture. After twenty-four hours rub off with a soft linen cloth. It will keep clean for months under ordinary circumstances.

A Brilliant Black on Iron and Steel. — This may be produced by applying, with a fine hair brush, a mixture of turpentine and sulphur boiled together. When the turpentine evaporates there remains on the metal a thin layer of sulphur, which unites closely with the iron when heated for a time over a spirit or gas flame. This varnish protects the metal perfectly, and is quite durable.

To Harden Steel. — Take two teaspoonfuls of water, one half teaspoonful of flour, and one of salt. Heat the steel enough to coat it with the paste by immersing it in the composition; after which heat it to a cherry red and plunge it into soft water. If properly done, the steel will come out with a beautiful white surface. Stubbs's files are said to be hardened in this manner.

Liquid Glue. — The *Muster Zeitung* recommends, in preference to the treatment of glue with nitric acid, the following: So-called gelatine is dissolved in the water-bath in its own weight of strong vinegar, a quarter part of alcohol, and a very little alum. This glue remains liquid when cold, and is much used for cementing mother of pearl, horn, etc., upon wood or metal.

PHOTOGRAPHIC NOTES.

Negative Varnish. — Klauser uses a varnish made by dissolving one gram of mastic and 16 of dammar in 160 cc. of benzole. The varnish is flowed on the negative cold.

Permanent Sensitized Paper. — Monckhoven adds to the positive silver bath a quantity of magnesium nitrate equal in weight to that of the silver nitrate employed.

Test for Good Gelatine. — Schlegel advises soaking a sample of gelatine in a 1 to 3 solution of ammonium bromide for two hours. If it merely swells up during that time it is fit for making the gelatine emulsion, but if it becomes jelly-like, or even liquid, it cannot be used for that purpose.

Ammonium Carbonate in the Developer. — According to Cordons, in *Monit. Phot.*, the picture will lie more within the film, be much stronger, and be more easily regulated, if ammonium carbonate is used instead of liquid ammonia for developing. He says there is scarcely any danger from fogging.

A "Pyro" Solution that will Keep. — In place of the usual alcoholic solution of pyrogallic acid, Wortley, in *Phot. Mitth.*, recommends a solution of one part salicylic acid and 10 of pyrogallic acid in 1000 of water. Of course ten times as much of this preparation is needed as of the ordinary 10 per cent. solution.

Bromide of Silver. — Eder has shown, in *Chemisches Centralblatt*, that bromide of silver prepared with excess of nitrate of silver is much more sensitive towards light than one prepared with excess of bromide of potassium, provided the bromide of silver is disseminated through an indifferent substance, like collodion. If disseminated through gum or gelatine, bromide of silver prepared with a slight

excess of soluble bromide is four to six times more sensitive than in the case first mentioned.

CELLULOID IN PHOTOGRAPHY. — Celluloid is making its way as a photographic medium. M. Fortier, by graining it with pumice moistened in oil, has produced plates which can be substituted for the ground glass of the camera in case of accidental breakage. M. Londe, on the other hand, has endeavored to make celluloid plates more transparent by washing their surfaces with acetic acid, that being a solvent of the substance. Unfortunately, continues the *Photographic News*, this is liable to produce buckling in the plates, which is afterwards difficult to correct; it is better to try to obtain very white celluloid, as recommended by M. David.

Agriculture.

MUCK: A COMMOTION.

IN the September number of the JOURNAL the editor presented a brief note upon what is known among farmers as "muck." The article as a whole and the language employed were carefully considered, so as to be certain that it would convey no wrong or uncertain meaning. We believe the cautious yet explicit statements and views therein contained are sound and irrefutable, — in accordance with the deductions of exact science and the practical experience of observing, intelligent farmers everywhere. The object of the article was not to confuse farmers and lead them astray, but to put them on their guard against incurring expense and trouble for which no fair and just remuneration could be expected. The protection of husbandmen against errors and delusions, when their nature is distinctly understood, is the highest duty of those who have control of the agricultural press.

Language often fails to convey a writer's exact meaning, and hence misapprehensions arise; but we have endeavored to avoid this evil by clear and explicit statements, as is illustrated in the remarks upon muck. The article has caused much commotion and controversy, which finds expression in agricultural and other journals throughout the country. This we expected, as it is the misfortune of agricultural industries to harbor many errors which have been often pointed out, but which, for some strange reason, farmers like to keep alive after they have been crippled or utterly exploded. A man who is sure of his facts, and fearless in exposing delusions, is tolerably useful in any community, and certainly deserves well of those he is trying to serve.

This muck commotion has caused some side controversies of an amusing and rather interesting character. Notable among them is that found in the *New England Farmer*, in October. Vermont farmers have been enlightened and instructed for several years by Dr. Hoskins, the editor of an agricultural journal in that State. This doctor assailed furiously the views of muck we presented, and, having no knowledge of his own to present on the subject, summoned Professor Johnson to his aid. The sensible clear-headed editor of the *Farmer* turned the tables on the Vermont doctor, and showed him that he was entirely incompetent to understand the testimony of his own witness. He pointed out that instead of Johnson's testimony being adverse to the views we had expressed regarding the value of muck, they were *directly confirmatory of their truth*. This rather uncivil belligerent may be safely left with the editor of the *Farmer* to take care of.

That excellent farmer's journal, the *Rural New-Yorker*, has got into trouble in consequence of copying portions of the muck article from the JOURNAL. We are sorry for the apology that appears in a subsequent number, for there is certainly no need of it. It is clear that if the whole article had been copied the editor would not have been pestered with the letters from patrons which appear. No greater injustice can be done to a writer than to copy a part of his statement, and by omitting qualifications and explanations place him in a position to be misinterpreted and misunderstood.

The views upon the exact value of muck to agriculture, which we have expressed *as a whole*, we stand by. They are the result of exact information obtained in the laboratory and in the field, and we yield to no one claiming to have fuller or more complete knowledge of the subject. For a *quarter of a century* we have had in personal charge an experimental farm of about one hundred acres. It is probably one of the oldest, if not the oldest, purely experimental farm in the country, having its technical and analytical laboratories on the farm premises. We own two muck deposits, one on the farm and another within a short distance of it, and they are typical deposits, fairly representing the nature of the substance in its best condition as found in low grounds upon most farms in New England. Vegetable humus found in low grounds exists in various stages of eremacausis or spontaneous decay. It may be peat suitable for fuel, or a soft unctuous *mud* destitute of silex, or it may be part silex and part mud, in varying proportions. All varieties have come under experiment and observation repeatedly, in specimens sent to us from widely separated and distant localities, and the result of these observations is briefly, and consequently very inadequately, expressed in the article which has provoked so much hasty adverse criticism. If our friends of the agricultural press who desire to consider the important subject of muck will quote the *entire article* published in the JOURNAL, we shall have no complaint to make with regard to any intelligent opposing views they may have to offer. It is high time that the exact value of ordinary, low-ground humus was understood among farmers, and the discussion, if conducted with *knowledge* and without passion, will do good.

COMMON SALT AS A MANURE.

MR. J. B. LAWES, of Rothamsted, England, communicates to the *Cultivator* of this city some interesting observations regarding the influence and value of common salt as a manure. The results so fully correspond with those reached by us in an extended series of experiments several years ago, at Winnekeni, that we regard them as conclusive upon the subject. In the experiments made to test the value of salt as a fertilizer, we invariably found under all conditions its worthlessness was made manifest. And indeed we ought to expect such results. Hydrochloric acid, one of its constituents, is not plant food; neither is soda, to any important extent. The secondary or indirect influence of salt is proved to be unimportant. In no form, either as an adjunct to other substances, or as a direct agent, have we found salt beneficial to crops. Mr. Lawes's views may be learned from the following excerpt from his article: —

With regard to the influence of salt on vegetation, or of soda generally, although I am in possession of a great deal of evidence upon the subject, my mind is by no means made up. That soda cannot perform the functions of potash is perfectly evident; at the same time there is no reason why it may not perform some of the minor functions of vegetation; if it cannot decompose carbonic acid, it may, at any rate, perform the menial office of carrying away the decomposed products, and thus leave the potash more time to execute its more important duties.

In the ash of the juice of one of our experiments on sugar beet we found, on an average of three years, as much soda per acre as would be contained in two hundred pounds of common salt. In other experiments where common salt was liberally used, not more than four pounds of soda were taken up. It is quite evident, therefore, that, in the absence of any of the more important ingredients of plant food, soda is useless.

In Great Britain the use of salt as a manure, which at one time was very large, — more in consequence of the exertions of those who had that substance to sell than from any benefit derived from its application, — has now almost entirely ceased; and it would appear that, at all events as far as this country is concerned, the rain water is competent to furnish all that is required by vegetation.

A POULTRY FARM.

THE *Providence Journal* gives the following interesting description of a Rhode Island poultry farm: —

In the southeastern part of the State, in that delectable country made fertile and inviting by the help of the kelp of the sea, much attention is given to poultry and the production of eggs. The business there has been reduced to a science. It has been demonstrated that a hen and her kin are paying animals. On a point of land near the mouth of Seaconnet River, or the east passage, is the poultry farm of Isaac C. Wilbur, whose hospitality and worth are well known. The farm comprises about 200 acres, the greater part of which is devoted to the raising of poultry and the production of eggs for market. The ancestral dwelling-place, with lawn, conservatories, and shade-trees, abuts the highway. No marauding chicks meander hereabouts or walk into the kitchen to sample pies left on the hearth to cool, as the chicks are wont to do when they are not restrained. None are allowed about the house, and none come there. The land or meadow slopes from the highway to the beach, on which the Atlantic throws its breakers and the kelp to enrich the land. This stretch of meadow is divided into lots, and in each of them, or many of them, is a colony of chicks. Each colony has a habitation of its own, knows it, and patronizes no other. Here the colony deposits its eggs, is fed, raises other colonies, and abides until its career of usefulness is run, when another colony takes its place. About 50 individuals comprise a colony, and there are 30 on the farm, each provided as stated above. The whole number of hens and chicks is then about 1500. The eggs are shipped to Providence and Boston. Mr. Wilbur markets the eggs of his neighbors, some of whom are extensive producers, as well as his own, and has shipped in one week as many as 4000 dozen. From the farm will be marketed this year about 1200 geese and as many ducks. The goose is known by its voice, also the duck, and a half dozen of each are able to make noise enough to satisfy a whole village, but 1200 of each! — language fails to do jus-

tice to the racket. All except the stock geese, of which there are 50 or more, are kept in pens and fattened until death, which happens every day with respect to some of them.

HINTS FOR FARMERS' WIVES.

ONE of these "helpmeets" gives her sisters the following practical hints for "washing-day," through the columns of the *New England Farmer*: —

We try to make our washing as easy as possible, for there is a limit to the strength of hired help, as well as to the strength of those who hire. Make a good warm suds with soft soap, adding a teaspoonful of ammonia for each pail of water. Put the dirtiest (white) clothes at the bottom of the tub, using just water enough to have all thoroughly wet. Let them soak over night. In the morning add hot water sufficient to make the whole comfortable to the hands, and run the clothes through a good wringer; but few pieces will need rubbing. Boil, drain, and rinse once. Meanwhile, the dirtiest of the colored clothes have been soaking for half or three quarters of an hour, making them much easier to wash. Some may object to the use of strong alkalies, on the ground that clothes are rotted. I think the clothes last as long as when rubbed and wrung in the old way. If it injures the hands, wash them in vinegar and water.

We make our own soft soap as follows: Take twenty pounds each of potash and rendered grease; put into a barrel, and add a dozen pails of cold water (rain water is best). Let it stand a few days, stirring occasionally, when the grease not eaten by the lye will have formed a crust on top. Now, take two or more pounds of borax, put into the boiler with two or three pails of water, heat to boiling, and turn into the barrel; this will melt the grease, which can then be thoroughly stirred in, and not much of it will again rise to the top. When the grease all disappears, you have a barrel of good soap, almost thick enough to cut. This method requires more time, but far less labor, than the old way of leaching and boiling.

GLEANINGS.

THE DEMAND FOR COWS. — An exchange says: That there is a scarcity of cows in this country is plain. Prices have been going higher for some time, and the demand is sharp. There is no immediate prospect that lower prices will rule very soon. The increasing consumption of dairy products at home and abroad is one thing that keeps prices high. Besides, there is a stronger demand in towns and cities for good milch cows than has been known heretofore. A large number of persons, whose means admit of keeping a cow for their own use, prefer doing so than to pay for milk largely diluted with water. An exchange published west of us says that butchers have nearly as much trouble to get stock as the dealers, and have to pay steadily stiffening prices. The shipments to Europe and the immensely increased demand for meat in our own country will shortly divert the attention of farmers in the Mississippi Valley more exclusively to the production of beef and mutton, and less to wheat. Our dairymen will have to manage their cows better, and get more milk from a smaller number, until they can raise some of their own, a thing they will be obliged to do for economic reasons. Farmers will have to study up and apply the methods of business men in their business.

TESTS FOR GOOD BUTTER. — Mr. Robert Hall, butter inspector in Ohio, says: When butter is properly churned, both as to the time and temperature, it becomes firm with very little working, and it is tenacious; but its most desirable state is waxy, when it is easily moulded into any shape, and may be drawn out a considerable length without breaking. It is then styled gilt-edged. It is only in this state that butter possesses that rich nutty flavor and smell, and shows up a rich golden-yellow color, which imparts so high a degree of pleasure in eating it, and which increases its value manifold. It is not always necessary, when it smells sweet, to taste butter in judging it. The smooth unctuous feeling in rubbing a little between the finger and thumb expresses at once its rich quality; the nutty smell and rich aroma indicate a similar taste; and the bright golden, glistening, cream-colored surface shows its height of cleanliness. It may be necessary at times to use the trier, or even use it until you become an expert in testing by taste, smell, and rubbing.

THE ENGLISH POTATO CROP. — The London *Garden* says: Both fungologists and practical men are puzzled this season to account for the comparative absence of disease amongst potatoes. The condition of things is said to be abnormal. Two months ago or more, when the weather broke up, it was predicted we might expect the disease to manifest itself as usual; yet after a long period of bad weather, which has worked more destruction to the grain harvest than any one of the present generation remembers, we have a good sound potato crop, — in some cases, indeed, little or no disease whatever. Potatoes are a drug in the market, and farmers are already complaining that crops are too good to pay. In Scotland the season has been cold and unfavorable all through, and the autumn wet and cold; but potatoes are good, and retailers are selling them at 5 d. (10 cents) per peck. Planting time was dry and favorable for operations as a rule, and during the growing season the crops had a spell of seasonable weather, which may have hardened the tissues of the plant; but, be this as it may, the present state of the crop is an enigma.

A HINT FOR THE STABLE. — It is said that kerosene oil slightly sprinkled on the floor of the horse-stables will serve to abate the nuisance of flies. It may be shaken out of a bottle through a hole in the cork. A pint will last a week for the purpose.

PENNSYLVANIA MAPLE FORESTS. — A Harrisburg paper calls attention to the maple and hemlock forests of Pennsylvania, and remarks that there has never been the right kind of enterprise to render those woods as important and useful as they merit. It is claimed that the maple wealth of the Keystone State is as great as that of black walnut once was, if properly handled, because the wood is hard, and can be utilized to produce a beautiful effect in building and furniture. There is an enormous supply of maple in Pennsylvania, and it is predicted that sooner or later it will become one of the most profitable sources of industry in the State.

WHY ARE THE PRAIRIES TREELESS? — Professor Meehan is of the opinion that annual fires have been the reason why arborescent vegetation has never had an existence on the prairies. Father Hennepin, the earliest writer on Indian habits, noted that it was their practice in his time to fire the prairies annually; it is probable that such had been their habit long before. Herbaceous plants and annuals could increase their area yearly, while trees could never get beyond the line they had reached when the annual fire first commenced.

THE AGRICULTURAL CHEMISTS. — A second annual meeting of the Society for the Promotion of Agricultural Science was held in Cincinnati, August 16 and 17, 1881. A number of interesting papers were read and discussed. The next meeting will be at the call of the Executive Committee. Prof. W. J. Beal, of Michigan, was elected president, and Dr. E. L. Sturtevant, of Massachusetts, secretary.

Boston Journal of Chemistry.

JAS. R. NICHOLS, M. D., *Editor.*
WM. J. ROLFE, A. M., *Associate Editor*

BOSTON, DECEMBER 1, 1881.

BAD WATER IN BOSTON.

THE good people of this city are greatly perplexed and annoyed at the unpleasant taste and odor pertaining to the water which is furnished by Lake Cochituate and the other sources of supply. It is indeed exceedingly repulsive, and apparently unsuited to culinary uses. It is, however, but an exaggeration of conditions which have often caused complaint in the last thirty years. The trouble will come along at intervals so long as water is drawn from present sources of supply; and it springs, in our view, from causes which all the chemists and botanists in the country will fail to remove. For a period of thirty years we have studied this peculiar phenomenon of the changed conditions of pond waters in New England, and we know that there are but few ponds which do not at some time exhibit changes corresponding with those now so troublesome in the Boston water supply. It is a vicious condition never met with in cities or towns where the supply is taken from rivers or large streams solely. It has never occurred in Lawrence or Lowell, in which cities water is supplied from the Merrimac River; but it does occur in nearly or quite all places where supplies are drawn from the quiet little basins or ponds so common in Massachusetts. The city of Haverhill is supplied from such ponds, and we learn from records kept for thirty years that it has been observed some time in the year during twenty-one of the thirty years. As has been the case in this city, the nauseous taste appears in the extreme cold of midwinter and during the heats of summer. More than twenty years ago, before the new sources of our Boston water supply were opened, this taste was so offensive as to cause alarm, and a commission was appointed to investigate, of which the late Dr. C. T. Jackson and Professor E. N. Horsford, of Cambridge, were members. We were led at that time to make thorough examination of many ponds, beside Lake Cochituate, in New England, and the conclusions reached differed from those of the distinguished gentlemen appointed by the water board. They were led to conclude that the filthy fishy taste was due to *algæ* and other vegetable growths, found on the margin of the lake. We could find no corroborative evidence of this in any of the ponds to which investigation was directed. On the other hand, experiments and prolonged study of the phenomenon pointed directly to *animal life* as the cause of the trouble.

This interesting and most important subject requires more space for even a brief discussion than we have at command at present, but in the next number of the JOURNAL it will be again considered. It may be further said, however, in this connection, that the evil cannot be removed easily, or perhaps by any agencies at our command, as it arises from natural causes which operate not constantly, but intermittingly, and so will continue to operate as long as meteorological movements are fickle or changeable. However disagreeable the water may be at the present time, it is not probable that it exerts a very

marked influence upon the public health. The cause of the evil is not sewage, or substances in large amount which hold nitrogenous combinations of a deleterious nature, but it is of the character of an exhalation or exudation from animal sources, which will be pointed out in the next number of the JOURNAL.

THE END OF THE VOLUME.

IT is needless to inform our readers that the present number completes the fifteenth volume of the JOURNAL; but they will pardon us for acceding to the request of the publishers that renewed attention may be called to the *bills* which, as was announced last month, are to be sent out with this issue. We bespeak for them *immediate* attention, both because the amount is so trifling that no one is likely to need any indulgence in paying it, and also because the claim, being so very small, is liable to be overlooked or forgotten if not settled as soon as received. Our friends will bear in mind that the dollars which are due, so insignificant when viewed singly, are in the aggregate of vital importance to the JOURNAL, being the means by which the publishers are enabled to prepare and distribute it monthly through the length and breadth of the land. Let the dollars then be sent in promptly, the remittance to be made according to the directions in the "special notice" on another page.

We would also again call attention to our "Clubbing List," sent out with this number, as with the last, reminding our subscribers that by ordering of us one or more of the other periodicals they take, the cost of the JOURNAL is reduced to almost or quite nothing. Let them examine the list carefully before ordering their magazines and newspapers for A. D. 1882.

THE DENTISTS.

THE American Academy of Dental Science held its annual meeting in this city October 26th. The annual address was delivered by Dr. F. N. Seabury, of Providence, who took for his subject "The Professional Spirit, False and True." He briefly sketched the model dentist, what he should be socially, scientifically, and professionally, and contrasted him with the man whose sole aim and end was money-getting. Dr. S. F. Stearns, of this city, then read a paper on Anæsthesia, in which he stated that he had given ether, chloroform, and nitrous oxide gas, as well as freezing the gum with rhigolene, each in turn a fair trial, but had returned to the use of ether. His method of administering is by the nose, directing the patient to inhale only through the nose and exhale by the mouth. In this way he had etherized with one and one half ounces of ether persons who had previously taken a pound without effect. The ether is applied on a napkin folded into funnel shape, leaving an aperture of one half to three fourths inch at the smaller end. Dr. B. Lord, of New York, made some appropriate remarks on the old way and the new, saying that he did not think all the changes were improvements. A paper on "Dentists as Specialists," by Dr. G. L. Parmele, of Hartford, was read by the secretary. As now practiced, dentistry is not a specialty of medicine, nor will it be until every dentist is required to take a full course in medicine and graduate as an M. D. He strongly advised dentists to do this. Dr. H. C. Meriam, of Salem, discussed the treatment of exposed pulp, whether diseased or wounded, and presented to the members present samples of gutta percha softened with oil of cajaput for capping, etc. The society then partook of the annual dinner at the Hotel Vendome.

HONORS TO FOREIGN CHEMISTS.

SEVERAL of the distinguished chemists mentioned in our recent article on German Universities have been the recipients of various tokens of the esteem in which they are held. Prof. A. W. Hofmann, of Berlin, who was for several years a professor in the Royal College of Chemistry, at London, has recently had conferred upon him by the Society of Arts their highest honor, namely the Albert Medal.

On the 31st of July, 1880, Prof. Fredrich Wöhler celebrated his eightieth birthday, and was made the recipient of a large gold medal and a memorial tablet bearing a life-size relief bust in marble of the aged chemist, presented by his former pupils in Europe and America.

During the past summer Prof. Adolph Wurtz, of Paris, was appointed a life member of the French senate. His old pupils also presented him with a commemorative medal.

On the 17th of October last Prof. Robert Bunsen celebrated his semi-centennial *doctor-jubiläum*. Fifty years previous his alma mater had conferred upon him the degree of doctor of philosophy. In Germany this event is often celebrated by the university presenting to the person, if he has distinguished himself, a second doctor's diploma. The pupils and friends of Bunsen proposed to present to him on that day some token of their esteem, and a committee was appointed for that purpose, but at so late an hour that Americans were debarred from taking an active part in it.

The German Emperor has recently conferred the great Prussian gold medal for art and science upon Mr. George Matthey, F. R. S., of the well-known firm of refiners in Hatton Garden, London, in recognition of his services in the interests of science.

OPERA THROUGH THE WIRE.

ONE of the most interesting experiments at the Paris Electrical Exhibition was connecting the Grand Opera House and theatres of the city with the Exhibition rooms by telephone, and listening to the music and the words of the actors during the performances. A correspondent of the London *Times* gives a pleasant description of the experiments: —

I must now describe the very interesting application of these instruments in giving people in the Exhibition the pleasure of listening night after night to the splendid companies at the opera and at the Théâtre Français. Rooms have been fitted up in the galleries, each with a number of pairs of telephones. Two rooms are devoted to the opera and two to the theatre. The former is the more interesting, for there the actions and features of the performers are of less importance. You enter the room in groups of perhaps ten at a time. Each one advances to a wall and seizes a pair of telephones, which he places to his two ears. Each of these is connected with a microphone on the stage of the opera, one to the right, the other to the left, of the prompter, and inclined towards the singers. The microphone to the right of the prompter is connected with the telephone at our right ear; the one to his left is connected with that at our left ear. Thus, while the singer moves to right or left, the sounds increase or diminish in the right or left ear; when they advance or recede, the sounds increase or diminish in both: and thus we are able to appreciate their movements, and it becomes difficult to believe that the performers on the stage are not directly behind the wall which we are facing. So soon as the telephones are applied to the ears the glorious voices of the finest singers in Paris are heard by us, undiminished in purity, beauty, or force by the strange means which have carried them to us over a distance of a mile. The orchestral accompaniment is somewhat weak, owing to the arrangement of the microphones. We can almost see the singer move about, putting expression into the music by movement and action; and in no part of the Opera House can you hear with greater (I might almost say with so great) clearness and power than in this tapestried room in the Palais d'Industrie. It is somewhat curious to watch the different listeners, if we have not a telephone in hand ourselves. Perfect silence reigns; ten people stand round, with their hands holding to their heads things which look like large ears. You see an expression of satisfaction, of sadness, of rapture, on their faces; they look at each other and express approval with their eyes; and when the end of the solo has been reached, and they hear the clapping of hands and bravos of the audience, they lay down their telephones, and frequently join their applause, unheard, to that of the audience at the opera, unable to restrain themselves from the expression of their delight. There are a few defects, but these are of minor importance. The orchestra is a little too much subdued; a crackling noise is sometimes heard (but very rarely), which comes from the microphone; and there are special notes which seem to be reinforced by the instrument, and to be heard with undue loudness. These defects are, however, hardly noticeable; and, as a rule, the deepest bass and the highest soprano can be listened to and heard through all their most delicate changes as accurately and almost with as great pleasure as at the opera itself.

CULTIVATION OF SPONGES.

WE find in the *Oil and Drug News* a description of a successful attempt at sponge cultivation at Pine Key, Florida. The growth of the sponge is much more rapid than had been supposed; pieces that were only two inches long when transplanted grew to be seven or eight inches in diameter in seven months. The duration of life is yet unknown, and it is believed that the finer Mediterranean sponges grow more slowly; but if we are able to transplant them to our waters, we can certainly raise them much cheaper than we can import them. The practicability of sponge cultivation is now demonstrated, and we may expect to see ground staked for "sponge-beds" as it is in the North for "oyster-beds."

THE STUDY OF CHEMISTRY.

A WRITER in the *Chemiker Zeitung* discourses as follows regarding chemistry and its votaries:

Such a high, important, and all-embracing science as ours requires much time and labor for its study and comprehension. Therefore, whoever wishes to undertake the large and magnificent exercise of studying chemistry must be free from other cares that might embarrass him; he should, in a word, possess the necessary means. Understand me aright, — means of different kinds, mental, physical, and pecuniary. When all these are united, those illustrious men are developed who seem to obtain for-

tune, renown, and riches without an effort. When part of these means are wanting, we see men developed who are less brilliant, but still have a comfortable existence. When all are wanting, and unfortunately that is by far most frequently the case, then the young chemist condemns himself to a career of pitiable discouragement and melancholy, of continual depression and starving triviality.

Every young man who wishes to study chemistry should first ask himself whether his mental powers are not better suited to be a shoemaker or tailor, two very worthy trades; next, he should ask his physician whether he is feeble or a blockhead; and then, lastly, he should ask his father whether he is in such a position that he can support him during his long years of study. When this day comes, and not before, shall we see chemists well paid. Then the chemist will be able to reject with scorn the miserable positions that hardly pay the interest on the capital expended in study.

METEOROLOGY FOR OCTOBER, 1881.

The sum of my observations on the weather for the past month has been as follows: —

Average Thermometer.		Lowest.	Highest.	Range.
At 7 A. M.	47.48°	28°	68°	40°
At 2 P. M.	60.86°	40°	84°	44°
At 9 P. M.	51.97°	30°	78°	48°
Whole month	53.25°	28°	84°	56°
Last 18 Octobers	48.75°	40.60° in 1864.	56.16° in 1879.	15.56°

The average barometer for the past month was 30.091 inches, the lowest 29.43, and the highest 30.40, a range of .97 of an inch. The sum of daily variations was 6 06 inches, giving an average daily movement of .196 of an inch. The average for the last nine Octobers has been 29.964; the lowest 29.826, and the highest 30.091, the present year.

The face of the sky in 93 observations gave 56 fair, 6 cloudy, 22 overcast, and 9 rainy. The amount of rain was 2.30 inches; the average for the past thirteen Octobers being 4.25 inches, the lowest .75 in 1874, and the highest 13.20 in 1869, a range of 12.45 inches. No thunder nor lightning during the month.

The direction of the wind by the usual observations gave an excess of seven northerly and forty-nine westerly over the southerly and easterly, indicating the prevailing direction to be west 8° north, less than one point north of west. The average direction for the past thirteen Octobers has been west 1° 10′ north, or very nearly due west.

Another unusually warm and also dry month for mid-autumn, with high barometer. The temperature was just four and a half degrees above the average for the last eighteen Octobers, and the rainfall nearly two inches below the average for the past thirteen, or but little over one half the usual amount. Hence the springs are very low, water scarce, and even expensive in certain localities. But the most striking peculiarity of the month was the

SUDDEN FREEZE

on the 5th. There had been no preceding frost in this region during the autumn, nor scarcely the warning of any. The thermometer stood at 50° at nine o'clock the evening before, but in the morning windows were adorned with abundant icicles, two inches long, more or less, with ice wherever water in small quantities was exposed. An intelligent and careful observer of nature, of threescore and ten, told the writer that he never before knew a severe ice turn to precede an ordinary frost. This sudden freeze did great damage, especially to the grape harvest. Tons of grapes were ruined by it, and other tons more or less injured. Farmers and everybody else seemed to be taken unawares by the suddenness of this unseasonable cold. The night following was not so severe by some four degrees as seen by corresponding observations. The warm weather soon returned, and there were but few other frosts during the month, which began and closed with summer-like weather. The first day averaged 75° and the last 62°. The coldest days (5th and 26th) averaged 36.25°. D. W.

Natick, *November* 8, 1881.

EDITORIAL NOTES.

Wonderful Glass. — The "toughened" glass about which we have heard so much is remarkable in its way, but the "toughest" story about glass that we have seen appears in the advertising columns of a newspaper printed in a Southern city. Down there it seems that spectacles are made of "medicated glass," which has been analyzed by French, German, and American oculists, and pronounced to be "superior to any glass as yet made." Here are a few of the advantages of this vitreous marvel: —

"(1.) The chemicals soften the light to the eye, completely doing away with that tiresome sensation that is usually experienced in using glasses after one or two hours' use.

"(2.) The medicated properties contained in the glass make it as hard as a diamond. It will retain its polish, and never become dull or dim; hence you will always see through it as bright and clear as at first.

"(3.) The chemicals keep the glasses cold as ice; result is, your optic nerves always cool, doing away with any feverish sensation to the eye."

What is quite as extraordinary, "granulated and sore eyelids" are "cured" by using the glasses. Whether they will enable the blind to see is not stated; but it would seem that but a slight "improvement" in the glass can be required to bring this about. That so transparent a humbug should thrive sufficiently to justify a "big" advertisement in a city daily is almost incredible; but the gullibility of the human race is apparently boundless.

Itinerant Physicians in West Virginia. — Section 14 of the West Virginia State Board of Health Law reads: "Any itinerant physician who shall practise, or offer to practise, medicine in this State, or who shall, by writing, or printing, or any other method, publicly profess to cure or treat diseases, injuries, or deformities, shall pay to the State Board of Health a special tax of fifty dollars for each and every month and fraction thereof he shall so practise." Three days after the law went into effect, an Ohio "itinerant physician" paid fifty dollars for his special privilege in the city of Wheeling.

Fugitive Inks. — An exchange says: "The aniline violet pencils now extensively used in this country, as well as inks made of the same coloring matter, must be understood to produce writing of a very fugitive character; well enough, perhaps, for amatory correspondence, which, in order to be in character with the feeling that prompts it, is possibly better to be of a somewhat transient kind. It is, however, different with most writing, and permanence is commonly recognized as an essential characteristic; and, as we have said, this quality does not belong to inks of the aniline violet series. A druggist whom we know found out this to his cost. He labelled some of his bottles with purple ink of a most telling brilliancy, but some time after was much surprised to find that not a trace of the writing was to be seen. The light effectually bleaches the aniline, and we have noticed that exposure in a damp place produces the same effect."

Sir William Thomson's Geography. — In his address before the British Association, Sir William Thomson, in developing his idea of the transmission of power to a distance by means of the electric current, says: "Taking Niagara as example, and with the idea of bringing its energy usefully to Montreal, Boston, New York, and Philadelphia, I calculated the formula for a distance of 300 British statute miles (which is greater than the distance of any of those four cities from Niagara, and is the radius of a circle covering a large and very important part of the United States and British North America), I found, almost to my surprise, that, even with so great a distance to be provided for, the conditions are thoroughly practicable with good economy, all aspects of the case carefully considered." New York and Philadelphia are about 300 miles from Niagara in a straight line, but Montreal is outside the limit, and Boston more than a hundred miles beyond it.

German Polysyllables in Telegraphy. — We are not surprised to learn that the preposterous length of many German words has led to restricting the length of the telegraphic "word" in Germany to fifteen letters; but we were somewhat amused at reading the following account of how the thrifty folk try to evade the regulation, and how the tables are turned upon them: The German telegraph authorities have been taking measures against an abuse which sometimes occurs, consisting in mis spelling a word to bring it within a certain limit. Thus, in the word *Stammprioritätten*, one "m" will be left out, whereby the word is reduced from sixteen to fifteen letters, the limit for a single "tax-word." (In the correct form it would pass as two.) It is arranged that, should there be reason to think such misspelling intentional, the word shall be charged for as "groups of letters," in which case five letters are charged as one tax-word. Thus the word just mentioned would be charged as three.

The American Public Health Association. — The ninth annual session of this society is to be held at Savannah, Ga., from November 29th to December 2d, inclusive. It will be well worth attending.

LITERARY NOTES.

An old text-book is like an old almanac. It is true that science does not change, but the discovery of new laws and the new deductions drawn from well-known phenomena render frequent changes necessary. It is, however, in the applications of science that the most rapid advances are made. Of what use is a text-book on physics that ignores the invention of the phonograph, the telephone, and the improved methods of lighting by electricity? Publishers understand this, and the result is an avalanche of text-books on Natural Philosophy, some entirely new, and others revisions of well-known text-books, rewritten and brought down to date. Undoubtedly the best of these new editions that we have received is the *Natural Philosophy* of Rolfe and Gillet, of which we have already had occasion to speak. It is published by Potter, Ainsworth & Co., of New York.

A shorter treatise, adapted to the use of a younger grade of scholars, is *Peck's Ganot*, published by A. S. Barnes & Co. M. Ganot has published two text-books on physics, one of which, the more advanced, furnishes the basis of Atkinson's Ganot, the more elementary one that of Peck's Ganot. The latter has, however, been rewritten by Messrs. Burbank and Hanson, and brought down to the present time, several new cuts having been added, representing new inventions, such as the phonograph, the compressed air drill, etc.

The *American Chemical Journal* is the title of a periodical, now in the third year of its existence, which is devoted exclusively to the advancement of theoretical and applied chemistry. The researches and investigations of our American chemists are mostly to be found in its pages, together with reports on progress in the various departments of chemistry, and items of general interest to chemists. It is edited by Prof. Ira Remsen, of Johns Hopkins University, Baltimore, and is published about six times a year, at $3 per volume of six numbers. With the *Boston Journal of Chemistry* we can club it at $3.25 for six numbers of the former and twelve of the latter, or one volume of each.

The Student is the name of a monthly journal devoted to the interests of education in the Society of Friends. It is edited by Isaac Sharpless, Haverford College, Pa.

Many of the interesting papers read at the Cincinnati meeting of the American Association for the Advancement of Science have appeared in *Science*, which is fast taking a high rank as a scientific journal.

The Railway Herald will hereafter be published weekly, every Wednesday.

Medicine and Pharmacy.

FOOD FOR THE SICK.

The following, from one of Miss Scovill's admirable practical papers in the *Christian Union*, is quite as interesting and instructive for its hints on the administration of food to the sick as for those on its preparation: —

Ordinary beef tea does little harm, except when there is diarrhœa, which it increases; but neither does it do much good; and its place is well supplied by beef juice. To obtain this a thick juicy piece of steak should be chosen, and placed for a few moments over a brisk fire to draw the juice to the surface, then cut in strips, and pounded with a wooden pestle, or squeezed in a lemon-squeezer. The red gravy that runs from a properly-cooked joint of roast beef will answer as well when it can be had. Every particle of fat must be carefully skimmed from it.

The juice may be given either raw or cooked; sometimes one way, and sometimes the other. If raw, it may be thickened with finely-powdered soda-biscuit, or taken alone, if preferred, with the addition of a little salt. When cooked, a modicum of pepper and a few drops of essence of celery improve it. It must be taken from the fire as soon as it boils. It is a jelly when cold, showing that the albumen has been retained, and may be taken in that form for a change. Another method is to cut the beef in small pieces, and pour over it enough soft water nearly to cover it, adding a pinch of salt to draw out the juice. Let it stand three or four hours, and then strain. Four or five drops of hydrochloric acid may be put in each half pint of water, and will hasten the process; but this cannot be used in all cases, as acid is sometimes strictly forbidden.

A liquid is much more readily and easily taken through a tube than in any other way. It is very difficult to give a drink to a helpless person from a cup. There is always the risk of spilling, and if this is avoided it is still almost impossible to regulate it so that he can drink naturally and comfortably. It either flows too fast, so that he is forced to swallow with undesirable rapidity to avoid being choked, or so slowly that he gets it in unsatisfying sips, painfully suggestive of the tortures of Tantalus. All this discomfort can be prevented by the use of a bent glass tube. By raising the end a little as it is taken from the mouth not a drop of fluid need be lost.

A napkin ought in all cases to be placed under the chin, to avoid the possibility of soiling the night-dress or sheet. A single spot on either will destroy the comfort of a nervous patient for the entire time it remains there. It seems a small matter to the tired, anxious nurse; yet nothing is small that irritates or annoys the sufferer, wasting that precious store of strength which stands between him and death.

The difference between a tardy and a rapid convalescence depends very often upon the nourishment. A slight indigestion, or a little diarrhœa caused by improper diet, may bring back the worst symptoms of the disease. As much food as can be properly digested is required to repair the waste caused by illness; but it must be taken in smaller quantities and at shorter intervals than if the person were in health. A warm drink should be given at least as early as six o'clock in the morning, a light breakfast at nine, lunch at twelve, dinner at three, tea at six, and a supper — rivalling the breakfast — at nine; after which hour no invalid should be out of bed. A glass of milk must be put where it can be taken in the night.

Nicely prepared chocolate or cocoa is delicious those who like it. In making the former, the chief precaution to be observed is to mix it to a smooth paste with a little cold milk before pouring on the boiling milk. This prevents particles of undissolved chocolate from floating in the cup when it is supposed to be ready to drink. Cocoa nibs, the most popular form, are prepared by adding two ounces to a quart of water, and boiling for five hours, when it is reduced to half the quantity. Skim when it is cold, and heat again, adding boiling milk and sugar before serving.

Neither tea nor coffee should be given at night, for fear of causing wakefulness, though both are in place in the morning or at noon. The yolk of an egg well beaten may be stirred into a cup of coffee without its presence being suspected by the most fastidious palate, and so much additional nourishment administered unperceived. If it can be had, plenty of cream should be used with tea. Boiled new milk answers almost as well for coffee.

Any strong, good soup, — beef, veal, mutton, or chicken, — well prepared, nicely strained and skimmed, and served hot, will be relished by a convalescent. A few pieces of macaroni or vermicelli, boiled separately in milk and water until perfectly tender, can be added at the last moment. Barley or rice can be substituted for these. When the soup is best liked plain, small squares of toast, or oyster-crackers, can be eaten with it.

An invalid should never be allowed to touch hot rolls, or hot bread in any shape. Well-baked, light, home-made bread, if obtainable, is the most wholesome. If baker's bread must be used, let it be a day old; if it is too dry, it can be made into milk toast or plain buttered toast. Anything is better than running the risk of eating it fresh.

STATICAL ELECTRICITY IN MEDICAL PRACTICE.

BY CURT W. MEYER.

Many interesting communications have quite recently appeared in medical periodicals on the subject of statical electricity, or, as it has been and very properly may be called, Franklinism. There seems to be no doubt as to the value of Franklinism if it was readopted in medical practice; but some have objected to this, on the ground that the necessary apparatus is not yet in a condition to be used with good success.

Much credit is due to Dr. W. J. Morton, of New York, because he is the first, for some time, who has recalled the attention of the profession to Franklinism; and he has also furnished us with a very pleasing collection of historical notes, proving that successful results were obtained when Franklinism was formerly used, and when electrical machines were of comparatively poor construction, and consequently poor action.

Why should not statical electricity be readopted, when we have at our command lately improved apparatus which is immensely superior to that which the profession had to content themselves with formerly, and with which they accomplished such good results? A modern improved Holtz machine, with one 14-inch stationary plate, will generate far more electricity than the largest of the ordinary frictional machines formerly in use ever could do. The Holtz also generates electricity much more rapidly than the old style, and charges a number of condensers, or Leyden jars, in a comparatively short time. The machine as it stands may fairly be called complete, although improvements of great value and importance may be made; but, it seems to me, the latest suggestions as regards improving its action are not in the right direction.

To propose now, previous to its general use for medical treatment, that the machine should be large and powerful (see Dr. Morton's statement, *N. Y. Medical Record* April 23d) seems to me to be a jump, which, although it may prove to be in the right direction, is rather premature, and is not the way to secure the general adoption of the machines, for the following reasons: —

(1.) The former ordinary frictional machines had to be large to be powerful, while the Holtz is powerful even if small. The quantity of electricity generated from a single-plate, 14-inch Holtz is simply enormous, and its intensity is very great, owing to the nature of statical electricity. No more powerful apparatus, whether galvanic or faradic, has ever been practically applied in medicine.

(2.) Large or double-plate Holtz machines will considerably increase the necessary expenditure, and so retard their general adoption and the application of Franklinism. A ponderous apparatus will impress physicians unfavorably, and it has not yet been proven that the smaller will not give satisfactory results.

(3.) It has been noticed that when the conditions of the atmosphere are somewhat unfavorable the small machines still instantaneously obtain the charge, while very great difficulty is experienced in charging the larger and more complicated machines. The larger the machine the more difficulty in charging it.

(4.) A simplified construction of any apparatus will always prove to be superior to one with complicated mechanism, should such mechanism not be absolutely necessary. A machine, if complicated, is consequently apt to get out of order in so many more parts. I consider that the addition of a small frictional machine, in order to charge the Holtz machine, which by some has been claimed to be an improvement, is superfluous when the Holtz is a small one, or is not enclosed in a case.

(5.) In order to cause Franklinism to be generally adopted and applied by the profession, the rule should be to provide apparatus which would be within the easy reach of each member of it. After the application of this great force becomes more general, and the various developments show that a greater quantity of electricity can be applied with better effect, it will be time enough to adopt the larger and more powerful but much more expensive machines.

I do not intend to say that a small Holtz will have the same effect as a large one, but I wish to impress its real value, as it stands to day, for adoption in medical practice. A very large machine may sometimes be necessary for the electrification of several patients at the same time; but for the generation of the secondary statical current (discovered by Dr. Morton) I believe the small machine to be sufficient. The same applies to administering shocks.

The suggestion has been made that a machine be constructed that will work in all weathers. It is doubtful if we succeed in this, and if we do it may not be for some time to come; therefore the inability of the machine to operate at all times should not be a reason for abandoning it, or for delaying its adoption.

It has been asserted that Dr. Vigoroux, of Paris, enclosed his machine, with some drying substances, in an air-tight case, and succeeded in generating a current therein at times when it was impossible outside. This would indicate that a surplus of moisture in the atmosphere affected the working of the machine. But sometimes more moisture is needed. I have known my machine to work finely when the room was full of steam that had blown off from my boiler. Escaping steam is capable of generating electricity, as is well known. Water can be substituted for the inner metallic coating of the Leyden jar; in fact, this was the first form of a Leyden jar, etc., etc. Temperature has little effect on the working of the apparatus, for as good results are obtained when it is warm and dry as when it is cold and dry; but, it seems that more ozone is pro-

duced when it is cold and dry. Draught or wind must be avoided. The air should be quiet, in order that the best results should be obtained.

One cause which may affect the working of the apparatus is that the operator does not understand his business or his machine, and makes improper manipulations. Sometimes his very presence affects the surrounding atmosphere. Holtz machines also fail to work on account of the poor material of which they are constructed. The greatest care should be taken in the selection of the materials, especially the glass. An unsuitable composition of glass in the Leyden jars will prevent the charging of the machine, or will discharge it, should it have obtained the charge.

In an average year in New York city, a good machine will work from September until the latter part of June, with the exception of a very few days, or during a period of nine months out of twelve. At the last exhibition of the American Institute (1880) I operated my Holtz machine daily, from September 15th to November 27th, with the exception of two or three days when it refused to work, from the unfavorable condition of the atmosphere. It must be remembered that the exhibition building, heated with steam, with a large spray fountain continually playing, steam escaping from some of the engines, and with a vast throng of perspiring humanity moving around, thereby causing draught and dust, is not a favorable place for operating Holtz machines; yet, in all that time, with the exception of the two or three days before mentioned, my machine never failed to produce astounding results. Sparks eleven inches in length were continually discharged, while shorter sparks, from six to nine inches, but much more brilliant and intense, were produced with the aid of several condensers at each pole, and were discharged in rapid succession, with a noise fully as loud as the report of a pistol. An area not less than 36 feet square was so heavily charged with ozone as to be remarked upon by every one coming near. The machine, which was a single plate 22-inch Holtz, is still as good as ever, after all this wear and tear. This was one of the first trials in which a Holtz machine has been continuously operated for so long a time, and the result was far better than I anticipated.

It has been stated that the Holtz machine is *capricious*, but this is not the case. It is only *very delicate*, while the properties of the constantly changing atmosphere may be called capricious. In fact, the very property of being delicate makes the machine an indicator of every change which takes place in the surrounding atmosphere, and so increases our knowledge. Considering the great advantages which the modern apparatus possesses over the old, the point of its being delicate should not be objected to.

To recapitulate, we have in the Holtz machine: (1) a most delicate apparatus, which minutely indicates atmospheric changes of various character; (2) an apparatus which enables us to pursue a course of study which leads to an advancement in electro-medical science; (3) a machine which generates large quantities of ozone; (4) a machine which furnishes us with a statical electric current of great quantity and intensity for treatment by insulation; (5) an apparatus from which we obtain the secondary statical current, which will, no doubt, prove to have different effects from those of the secondary faradic current; (6) a machine which enables us to treat by sparks, sprays, and shocks; (7) a machine powerful enough to enable us to charge a body by induction, — by using a second insulating platform, the effect of which may differ widely from those of a direct charge; (8) an apparatus which costs but little, but is worth an immense amount, considering all the valuable properties it possesses.

On account of all this, it seems to me that the medical profession should no longer abstain from the general use of Franklinism, but go to work with the appliances now at hand, leaving for the results of experiments and continued use to show where improvements or modifications may be necessary to the manufacture of a machine capable of working most satisfactorily, and at all times, if possible.

It may be worth while to mention here that from an experience of over ten years' experimenting with the Holtz I have come to the conclusion that hand power is the best for operating the machine, as it needs to be constantly regulated to obtain the best results. A uniform motion, such as is given by a steam or gas engine, or a water or electric motor, sometimes causes the machine to discharge itself suddenly, besides making close observations impossible.

As regards electrodes, I do not think a very large number are necessary: several insulated ball electrodes, varying in diameter from ½ inch to 2 inches, an insulated point electrode, an insulated surface electrode with several points, for giving the electric wind over a large surface, and an insulated chain-guide and chain being all that are needed to begin with for practical use.

PUNCH AND THE DOCTORS.

The late International Medical Congress in London was a "success," not only from a scientific point of view, but also in a social way. The physicians from abroad were most sumptuously treated by their professional brethren in the great metropolis, though *Punch* is probably guilty of some merry exaggeration in his "Official Programme" of the Congress, which reads thus: —

First day. Grand banquet. Interesting experiments with various wines. Confidential exchange of experience after the third bottle.

Second day. Grand *déjeuner*. Surgical operations on cold fowls and raised pies. General investigation of "mixing." Valuable results obtained by taking a combination of champagne, sherry, port, claret, pale ale, and chartreuse vert.

Third day. Garden party. Examination of the action of the muscles in the game of lawn tennis. Close study of strawberries and cream and champagne cup. Supper experiment at the Albion. Extempore lecture upon the benefits to be derived by taking whiskey and water internally before retiring to bed.

Fourth day. Select dinner party of savants interested in food. Careful consideration of the effect upon the system of turtle soup, curried whitebait, canvas-back ducks, and an entirely new and original with-your-cheese pick-me-up, made of sardines, olives, truffles, cayenne pepper, tomatoes, capers, herring roes, fowls' livers, and tarragon vinegar. Human capacity for absorbing champagne in extra large doses practically tested. After the experiments a long consultation with the police.

Fifth day. Psychological picnic. Exercise of the nerve power of the lower limbs to the sounds of a military band. Interesting operation of a quadrille, a polka, and a waltz. Day finished with a scientific supper. Preparations of different kinds of meat. Practical lectures upon the anatomy of the fowl, the duck, and the turkey. Experiments in wine temperature. Claret seventy and champagne four degrees below zero. Perambulating difficulties and optical delusions. Exercise of the vocal chords. Subject: "We won't go home till morning."

Sixth and last day. All the foreign doctors ill in bed, sending for all the English doctors. General prescription: Large doses of soda water!

Corn smut has been recommended as a substitute for the ergot of rye.

ABOUT THE BRAIN.

Professor A. L. Ramney, in the *New York Medical Journal*, gives the following interesting facts and statistics concerning the brain: The average weight of the brain of a healthy adult of the Caucasian race has been given, by most of the prominent investigators upon this subject, as about fifty ounces in the male, and some six ounces less in the female. In the new-born infant the weight of the brain in the two sexes is more nearly alike, being about eleven ounces for the male child and ten ounces for the female. The rapidity of growth of the brain is not uniform throughout the different periods of life, since it grows rapidly until the age of seven years, then less rapidly until the age of forty is reached, when it attains its full development, and after that age it decreases in weight about one ounce for every period of ten years. It may be stated as a rule that the relative proportion of the cerebrum to that of the cerebellum is greater in the intellectual races; and that the cerebrum is developed in individuals in proportion to their intellectual power, although the absolute size may not be taken as a guide to the quality of the mind, since it is undoubtedly true that the brain can be improved *in quality* by exercise as well as the muscular tissue. That there are important individual differences in the quality of the generating nervous matter is evidenced by the facts that some small brains actually accomplish more and better work than larger ones, and that many women often show a higher degree of mental acumen than men, in spite of the fact that their brains are lighter.

A DERMATOLOGICAL DRAMA.

The *Moniteur des Sciences Médicales* publishes an amusing "dermatological drama," called "King Sulphur," which is said to be played at the Hôpital St. Louis. Sulphur is King of Cutis, and has just conquered Acarus. He lays his crown at the feet of Queen Friction, who has aided him in the campaign, and implores her to become his honored queen. But she insists first on making an assault on Favus, and totally destroying his arrogant rule. If afterwards Sulphur should burn with the same ardor she will consent. Then she leads forth her army, attended by Axungia, while Sulphur marches in her train. Meanwhile the old tried generals Hydrargyrum, Iodide of Potassium, and Turbith consult in angry conferences. Hydrargyrum is excited when he thinks that he, who has for forty years combatted with so much glory all the forces of the Syphilides, should now be set aside for this Sulphur. Iodide laughs at his fears, and mocks at the silly tactics of Sulphur in such a war. Then we are introduced to the palace of Queen Eczema, wife of Herpes, who confides to her faithful attendant Acne her fears as to the future; she imagines she is losing her bloom, and is oppressed with vague fears. The news of the advance of Sulphur with Friction and Axungia causes vast alarm. Great preparations are made to resist him, but his attack is irresistible, and at length Favus, Eczema, Herpes, and all their generals have to acknowledge themselves vanquished by this terrible parasite and spore destroyer.

THE EAR.

Danger of Boxing the Ears. — Dr. A. S. Core describes a case of the rupture of the drumhead from a severe blow on the ear while boxing. The fissure was about one eighth of an inch long, the centre of the wound being behind the insertion of the handle of the malleus. Under proper treatment, including lubrication with vaseline, the fissure healed perfectly in about a week's time.

Earache. — Wharton Jones says: In the course of practice you will often be called upon to attend case of earache. This means, pathologically spe ing, acute inflammation of the membrana tymp

Now, in such cases you may quickly subdue the inflammation, relieve the patient from the excruciating pain he is suffering, and save him, perhaps, from subsequent confirmed deafness. The treatment from which such a very desirable result may be obtained is similar to that which you will find so beneficial in analogous cases of eye diseases, namely, leeches behind the ear, hydrarg. c. creta and belladonna powders, with warm fomentations.

MISCELLANEA.

A NEW ANÆSTHETIC? — According to Dr. W. B. Conway, of Blacksburg, Va., in the *Virginia Medical Monthly*, the *perfume* from a skunk or polecat possesses anæsthetic properties. This discovery was made by a couple of students of the Virginia Agricultural and Mechanical College, who had secured a two-ounce bottle of this well-known scent; and concluding to play a trick upon one of their schoolmates, they entered his room, held him, and administered it (in its most concentrated form) by inhalation. The doctor could not ascertain what amount was administered. However, when he arrived he found the following symptoms: a total unconsciousness, relaxation of muscular system, extremities cool, pupils natural, breathing normal, pulse 65, temperature 94°; in which condition he remained for one hour. During that time small quantities of whiskey were administered at short intervals, with some difficulty in getting him to swallow. Friction was used about the extremities, also hot pediluvia. He was finally aroused, suffering no inconvenience from its effects, except a slight headache, which passed off after a good night's sleep.

STORIES OF DR. NELATON. — The *XIXe Siècle* relates of Dr. Nélaton that he was accustomed to say: "If you have the misfortune to cut a carotid when performing an operation, remember it takes two minutes for syncope to supervene, and as many more before death occurs. Now, four minutes are four times the time required for a ligature, provided you don't hurry yourself. Never hurry yourself."

The *Temps* says: "It is related that, when he began his studies, he worked with such ardor that he often refused himself the time necessary for sleep. He procured a plank some five or six feet long and forty centimeters broad, the extremities of which he placed on two chairs. He lay upon it, holding his book open above him. It is said that in this position the need of sleep is less readily felt. When, despite him, his eyes closed and the book fell, the shock disturbed his balance, and he followed the book. The shock aroused him, and he got up and began his work again."

DR. CHEYNE AND BEAU NASH. — When Cheyne asked Beau Nash if he had followed his prescription, his witty patient replied, "No, indeed, doctor, for if to I would have been dead." "How so?" asked she doctor, aghast. "Because," said Nash, "I threw it out of the window."

PHUNNY PHILOLOGY. — The London *Fun* gives the following: Ozone, literally eau-zone: a genuine natural aerated water which you drink in from the atmosphere. Iodine, from "I" "Ho!" and "dine," Let us have dinner!" So derived because "iodine" gives you such a wondrous appetite.

NICE NOURISHMENT. — Any one thinking of spending the winter in Nice had better take all his provisions or an analyst with him, for, according to the *Pharmaceutische Zeitung*, of eight hundred and fifty analyses made, in June, of food and beverages sold there, no less than five hundred and fifty-nine were found to be seriously adulterated.

EPILEPSY. — A. A. Sellers (*not* the "Colonel") gives the following information in the *New York Sun*: "If the epileptic sufferer will carry with him a piece of common black silk, big enough to cover the face, and, whenever he feels the fits coming on, will cover his face with it, he will find it a sure cure. This recipe was given to my father by an old Frenchman, my mother having been subject to fits for many years. She never had one afterward. When she felt one coming on she would place the silk over her face. I do not know the virtue of it, but do know from experience that it does the work."

SELECT FORMULÆ.

BOTTLING WAX PREPARED FROM A BY-PRODUCT. — A writer in the *Pharmaceutical Journal* says: The balsam of tolu, which has been used for preparing the syrup, has hitherto been utilized only in making a varnish for pills, and it therefore accumulates in course of time to a considerable extent. A composition useful as bottling wax may be prepared by stirring into the melted balsam one tenth its weight of levigated bole. It sets quickly, with a fine glossy surface, and is less brittle than the wax generally employed.

A mixture of residual balsam, amber resin, of each 4 parts, Venice turpentine, vermilion, of each 1 part, melted together and well stirred, forms sealing-wax of very fair quality.

FOR CHAPPED HANDS. — The following substitute for glycerine, camphor ice, etc., is given in the *Medical Brief:* Take of pure bay rum and glycerine each one part, quince-seed jelly two parts, mix. A few drops of oil of rose or any other perfume may be added to the bay rum before mixing. When diluted with rain water it forms an excellent dressing for the hair. The jelly is made by adding two drachms of quince seed to two pints of water, boiled down to one pint, filtered hot, and allowed to cool. For certain skin diseases a drachm of boracic acid may be dissolved in each ounce of glycerine before mixing.

STYPTIC COLLOID. — The following instantly coagulates blood, forming a consistent clot, under which wounds will readily heal: —

Collodion	100 parts.
Carbolic acid	10 "
Tannic acid	5 "
Benzoic acid	5 "

Mix the ingredients in the above order.

FOR RINGWORM. — The following is said to be a "sure cure:" —

Thymol	1 to 2 parts.
Chloroform	8 "
Olive oil	24 " M.

The thymol destroys the fungus, the oil prevents irritation and rapid evaporation, while the chloroform facilitates the absorption of the active ingredient by acting on the sebaceous glands.

CHEAP LAVENDER WATER. — The *Chemists' Journal* recommends the following: —

Essence of bergamot	3 ounces.
Tincture of musk	6 drachms.
Oil of clove	1 drachm.
Oil of lavender, English	4 drachms.
Rose water	12 ounces.
Alcohol	7½ pints.

SIMPLE REMEDY FOR CHAFE. — Bathe parts well in tepid water, dry well with soft cloths, and apply, by means of a soft sponge or cloth, the following: —

Zinci acetatis	gr. xv.
Morphiæ acetatis	gr. ij.
Glycerin., aq. rosæ	aa ℥ij. M.

Ft. sol. Sig. Apply to chafed parts twice or thrice a day.

PALATABLE COD-LIVER OIL. — Dr. Hager recommends the addition of 10 drops of chloroform to 100 grams of cod-liver oil to render it palatable and agreeable to take. The oil may be rendered still more palatable by dissolving in it, with the aid of heat, 5 parts of pure chloral hydrate in 100 parts of the oil. The latter is recommended in consumption, as it diminishes night sweats, produces sound sleep, and improves the appetite.

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Yours truly, LEWIS M. CLEAVER.

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Familiar Science.

HOW SPIDERS FLY.

BY PROF. C. A. YOUNG.

I WAS very much interested, a few days ago, in hearing a friend give an account of a manuscript she had seen, which was written by Jonathan Edwards when nine years old. It was an account of the behavior of certain small New England spiders, the manner they fly through the air, and the way to see them best, by getting into the edge of a shadow, and looking towards the sun. It is neatly and carefully written, and illustrated by little drawings, very nicely done. The philosophical tendencies of the young writer already appear, for his conclusion as to the "final cause" of spiders and their flying is this: the little animals are scavengers, and since, in New England, the prevailing winds are west, they are carried to the sea in their flight with whatever filth they have consumed, and so the land is cleansed.

Every one knows how, in sunny weather, the little creatures, standing on their heads, project from their spinnerets fine filaments of gossamer, which are caught by the breeze, and float off into the air, though still attached to the spider. When she perceives that the thread is long enough, and the pull of the wind sufficient, she releases her hold, and flies away on her gossamer like a witch on her broomstick; by watching her chance, and letting go only when the breeze is favorable, she is carried to her desired haven. Experiments have been tried by placing the animals on a chip floated in a pail of water. So long as the air was in motion about them they were able very soon to escape from their island; but when a bell glass was placed over the pail, thus preventing air-currents, they could not get from the island to the surrounding shore.

But how does it happen that, on setting out for a voyage, the spider almost invariably *ascends* with her web, and continues to rise, until, by pulling in her thread, she reduces her floating power, and so comes down? Spider-web, in and of itself, is not lighter than air: how, then, is its buoyancy to be explained?

In two ways, I think. When the sun is shining, every projecting object, like a twig or stick, absorbs heat more rapidly than the air, becomes warmer than the air, and thus acts like an independent source of heat in generating an ascending current, so that when the spider lets go her hold she and her thread are carried up partly by the action of this current.

But this is not all: unless I am much mistaken, *the action of the sun's rays on the thread itself and its surrounding envelope of air* is the main cause of its buoyancy. Air is nearly diathermanous, or transparent to heat, so that the solar rays, in traversing it, warm it only slightly. The spider's thread is not so, but in the sunshine warms up almost instantly, heating the air in immediate contact with it; and then, although the spider-thread alone is heavier than air, yet the thread and the adhering envelope of warmed and expanded air, taken together, are lighter than the same bulk of the cooler air around, and thus constitute a quasi-balloon, on which the spider sails away. Of course, if this is so, the poor creatures cannot sail much on cloudy days, and I think, in fact, they do not.

I have tried a few experiments to verify the idea, and so far as they go they all confirm it. For instance, one day in the autumn of 1880, when the air was full of floating gossamer, and there was no wind blowing, I caught some of the filaments at the end of a little stick, to see how they would behave. So long as I stood in the sunshine they streamed straight upwards, tugging with almost a breaking strain; as soon as I stepped into the shadow of a building, they lost their spirit, and drooped abjectly; the moment I put them in the light again they resumed their buoyancy. It is of course possible that in the shade there were local downward air currents to account for their behavior; but once a cloud passed across the sun, and they drooped then, just as they did behind the building.

The same theory will explain the buoyancy of any minute particles of dust or smoke. So long as the sun shines, they will absorb its rays, become warmer than the air, and surround themselves with a buoyant envelope, which will carry them up, if they are not too heavy in proportion to their surface. But if the air is still and the sun obscured, they will settle down near the earth, in the way we are all familiar with in muggy weather. Of course, if there is much wind, this will mainly control their movements, and neither their buoyancy in sunshine, nor their gravity in shadow, will be particularly noticeable.

PRINCETON, N. J., *November* 11, 1881.

ABOUT VOLCANOES.

THE popular idea of a volcano does not differ from the definition given in the school geographies: "A volcano is a burning mountain, from the summit of which issue smoke and flames;" but, as Professor Judd remarks in his recent book on "Volcanoes, What they Are, and What they Teach," this description "is not merely incomplete and inadequate as a whole, but each individual proposition of which it is made up is grossly inadequate, and, what is worse, perversely misleading." A volcano is not necessarily a mountain, though it often forms a mountain by the heaps of matter it throws forth. Essentially, it is a hole in the earth's crust, an outlet from the interior of our globe. It may exist, and often does, at the bottom of the sea, and in such cases it will not appear above the surface until it has built up an island with the ejected material. In the course of time the island may become a lofty peak, like Stromboli, in the Mediterranean, whose summit rises more than three thousand feet above the level of the sea.

Again, a volcano is not a "burning" phenomenon, though it looks much like it. The violent action is not combustion in any sense. Neither does the eruption always occur at the "summit" of the mountain, being quite as often from its sides or its base. The present crater of Stromboli is some distance below its top, and one can look down into it from points higher up on the mountain. On this account, and because the volcano is constantly in a state of moderate activity, it affords a peculiarly favorable opportunity of watching and studying the phenomena of eruption.

Neither "smoke" nor "flame" issues from the volcanic crater, as the definition we have quoted asserts. That which seems to be smoke is really condensing steam or watery vapor, and what looks like flame is merely the reflected glow from the molten lava beneath. If the vapor were not there to reflect the light we should see no "flame," nor anything suggestive of it When Vesuvius is quite inactive, as it was when we visited it in 1879, one sees nothing by day to indicate its volcanic character except the steam slowly rising from its top; but at night this steam is lit up with a ruddy glow at intervals, as the ever-seething caldron below bubbles up with increased vehemence and becomes incandescent. In a great eruption, enormous volumes of steam are poured forth, sometimes rising to the height of twenty thousand feet, or about four miles; and when these are illuminated by the intense light of immense lava streams, overflowing the crater in all directions, and rolling down the sides of the

mountain, it seems as if the world were on fire.

The tremendous nature of this volcanic energy and its mountain-building work were both strikingly illustrated in the formation of Monte Nuovo, on the shores of the Bay of Naples, a few miles north of the city, in the year 1538. From a spot of level ground, water, at first cold, but afterwards becoming warm, began to issue; then the earth cracked open, displaying incandescent matter within the fissure. Soon masses of stone, with vast quantities of pumice and mud, began to be thrown up to a great height, and this continued for two days and nights, forming a hill more than four hundred feet high. Less violent eruptions followed at intervals during the next five or six days, when the volcanic action ceased, and the place has been undisturbed ever since. Monte Nuovo is now a smoothly rounded hill, covered to its summit with a dense growth of pines; and as you ride past it, on an excursion to Lake Avernus (itself probably a crater, now converted into a quiet and lovely little pond, with nothing to suggest its ancient terrors) and the ruins of Baiæ, you would never suspect that, instead of being one of "the everlasting hills" which fill the landscape, it was the sudden product of volcanic forces only some three centuries and a half ago.

Many theories of volcanic action have been framed, but no one of them is entirely satisfactory. Professor Judd, in summing up the results of the latest investigations, is obliged to admit that "we do not at present appear to have the means for framing a complete and consistent theory."

It is a curious fact that volcanoes, almost without exception, are either on islands or along the shores of the continents. All the oceanic islands that are not coral reefs are of volcanic origin, and many of them are still the scenes of volcanic activity. A continuous ridge in the Atlantic, along which lie the islands of Jan Mayen, Iceland, the Azores, Canaries, and West Indies, contains forty active volcanoes and many extinct ones. A similar line in the Pacific, including the islands southeast of Asia, has a hundred and fifty active volcanoes, or nearly half of the whole number on the globe. Another great stretch of volcanoes, numbering eighty or so, is that along the western coast of the American continent, from near Behring Straits to Terra del Fuego, the "Land of Fire."

This proximity of volcanoes to the ocean has led to the theory that their action is due to the penetration of sea-water through cracks in the earth's crust to molten matter within. The chemical reactions that would follow, together with the expansive force of the enormous quantities of steam that would be formed in the confined space, are sufficient, it has been thought, to account for all the phenomena. There are difficulties, however, in this theory, as in all others that have been proposed, though we have not space to enlarge upon them here. At the same time, we must say that they do not appear to us to disprove the theory, and we cannot help regarding it as at present the most plausible explanation of volcanic action.

Stupendous as this action on its grandest scale must seem to us human insects, we should bear in mind that, when viewed with reference to the vast bulk of the earth, it is of the slightest and most superficial character. The upheaval of the loftiest volcano from the surface of the globe is relatively more insignificant than the development of the smallest pimple on a man's body; and all the torrents of lava and ashes that the volcano ejects, though devastating the region round about and burying cities and towns, are scarcely comparable to the "matter" that exudes from the tiny pustule. A grain of dust on a varnished globe a foot in diameter would represent the rising of Monte Nuovo, and a fine scratch on the smooth surface would be relatively as deep as the greatest of volcanic fissures. The vulgar notion that these cracks break through the whole crust of the earth to the central molten mass within — if such, indeed, there be — is based upon a childish misconception of the size of our planet. The phenomena appear vast and tremendous only because we ourselves are creatures so infinitesimally small that it is not easy for us to measure them in their relation to the great sphere of eight thousand miles in diameter on which they occur. To a mighty angel flying through the regions of space near our earth, the most violent of volcanic eruptions would be less noticeable than the scratching of a match a dozen rods off to yourself walking along the street.

EXPERIMENTS FOR YOUNG CHEMISTS.

BY PROF. E. J. HALLOCK, PH. D.

IV.

NITRIC ACID.

This acid, HNO_3, is made by the action of strong sulphuric acid upon potassium nitrate (saltpetre), and the reaction is represented by the following formula: $KNO_3 + H_2SO_4 = KHSO_4 + HNO_3$. Into a two-ounce (60 cc.) tubulated retort, like that shown in Figure 6, put 10 grams of pure potassium nitrate, in fine powder, and pour upon it, through a funnel inserted into the tubulure, an equal weight of strong sulphuric acid. Replace the glass stopper, mix the substances by shaking the retort very gently, and support it in the manner shown in the figure,

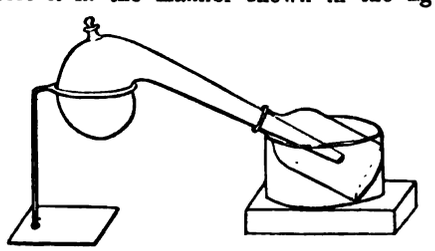

Fig. 6. Preparation of Nitric Acid.

with the beak of the retort projecting into a wide-mouthed bottle, which is to act as receiver. Cover the bottle with a wet cloth, and pour on it, from time to time, a little cold water. Some pieces of wet paper or cotton can be loosely inserted into the mouth of the bottle around the beak of the retort. When all is in readiness, heat the retort gently. The salt will melt, then red fumes will fill the retort, and soon a few drops of liquid will distil over. When fully in operation but few of the red fumes will be seen, and when they reappear remove the flame from under the retort. Before the mass within begins to solidify, remove the retort from its holder, take out the stopper, and pour out the contents. What adheres to the retort is easily dissolved out with hot water. This residue, $KHSO_4$, was formerly known as bisulphate of potash. Its weight should be over 13 grams, and if there were no loss of nitric acid we should get over 6 grams of that. The acid will have a red or yellow color, which will disappear if left standing in an open vessel. Several interesting and instructive experiments can be made with it. Pour a few drops of it into four different test tubes. In one of them put a piece of copper, in another a piece of iron or a nail, in a third a piece of pure tin foil, and in the last a strip of silver or a small *silver* coin. Red fumes will be given off from all except the iron. The copper and silver will dissolve; the tin will form a white powder of oxide of tin, but will not dissolve. If the tube containing the iron is heated, the iron will dissolve, too. Gold and platinum are the only metals not attacked by nitric acid; hence it was called *aqua fortis* (literally, strong water), and was employed to separate gold from silver and other metals. If nitric acid touches the skin it forms a yellow stain, which remains until the skin wears off. On black cloth it produces a brown stain that cannot be removed.

If we put a single drop of nitric acid in a test tube full of water, and then drop into it a strip of blue litmus paper, the latter will change to red. All substances which are able to produce this change are called acids. We shall subsequently find that all acids contain *hydrogen*, thus: hydrochloric acid, HCl; nitric acid, HNO_3; sulphuric acid, H_2SO_4; phosphoric acid, H_3PO_4. An acid may be defined as a compound of hydrogen, which, if soluble, will redden blue litmus, and the hydrogen is replaceable by a metal. When silver dissolves in nitric acid the metal takes the place of the hydrogen in the acid, and the resulting compound is called a salt. Nitric acid, HNO_3; silver nitrate, $AgNO_3$.

Testing for Nitric Acid. — Dissolve a little potassium nitrate in a test tube, and drop into it a crystal of ferrous sulphate, $FeSO_4$, or green vitriol. Then pour carefully down the side of the test tube two or three drops of strong sulphuric acid. As soon as it touches the green crystal a dark brown cloud will be seen to surround it and form a ring above the acid. This is very characteristic of nitrates. All nitrates are soluble, and hence we cannot make use of any reagent to give a precipitate with nitric acid. In a free state it gives red fumes with copper, and bleaches indigo.

Mix 1 cc. of nitric acid with 25 cc. of water, and add to it, drop by drop, some dilute ammonia. After a time it will be found that it no longer reddens blue litmus paper. The acid has been neutralized by the ammonia, and we have a solution of ammonium nitrate, NH_4NO_3, the substance used in making nitrous oxide, N_2O.

Correction. In our last number the formulæ of nitrous oxide was printed NO instead of N_2O, the small figure having dropped out.

MISO.

The Japanese, it is generally known, are a rice-eating people, but as rice contains little or no nitrogen, and flesh is rarely eaten by them, they make use of beans to supply this want. By combining the rice and beans with salt they prepare a kind of sauerkraut known as *miso*, which is not very palatable to foreigners. Professor Pen-

hallow, who has resided in Japan, describes the manufacture of *miso* in a recent number of the *Kansas City Review*. The proportions employed are stated by him to be as follows: —

Salt	2.30	bushels.
White beans	5.13	"
Rice	2 05	"

The rice is first soaked in cold water for two days; then drained, and put into fresh water, and steamed for three hours. It is taken out while hot, and spread on the floor of a warm room for four days, when it is found to be covered with an abundant growth of fungus. It is then taken from this close, damp room to a large, airy one, and spread on mats to cool for an hour and a half, and then transferred to small trays, where it is allowed to cool as rapidly as it can. As soon as cooled it is mixed with the beans, which have been boiled for six hours and allowed to cool over night in the boiler. The salt is also added, and the whole thoroughly reduced and incorporated in long mash-boxes, using a round pole as a pestle. The salt, it should be stated, is very impure solar salt, containing sticks, straws, and dirt.

The mixture, when it has been converted into a stiff, pasty mass, is placed in large vats, holding 87 bushels, and packed solid by the feet. The temperature is kept as low as possible, and a slow fermentation goes on for six or eight months, at the end of which time the *miso* is ready for the market. It forms a thick pasty mixture, of repulsive appearance and disagreeably sour odor.

SCIENTIFIC BREVITIES.

Tongues and Gizzards. — A recent English writer says: The common snail sets forth to ravage our gardens equipped with 150 rows of stout serrated teeth. The whole palate contains about 21,000 teeth, while a full-grown slug has over 26,000 of these silicious spikes. The whelk has a ribbon-like tongue, contained in a proboscis, with which it bores holes in the shells of the mollusks which form its food. The tongue has strong, saw-like teeth on the edges, with rows of finer ones between. In some mollusks the tongue resembles a tessellated pavement, with a tooth in the centre of each lozenge-shaped compartment. But although the palatal system of the snails forms a powerful and most efficient apparatus for triturating their food, it more closely resembles the gizzard of birds than the teeth of quadrupeds, and it is in the class of fishes that we find the first examples of true teeth, set in a bony socket and ranged at the opening of the alimentary canal. At what time the fashion of wearing teeth came in we have no means of ascertaining. If, however, the Darwinian theory be correct, at some enormously remote period of time some lucky animal developed the new weapon by a series of fortunate variations, and its possession gave to him and his posterity such a "pull" over their competitors that they were able to set the fashion, which has lasted to the present day.

Etching Glass by Electricity. — *La Lumière Electrique* gives an interesting note on the Planté method of engraving on glass by means of the electric current. A concentrated solution of nitrate of potassa is poured over a sheet of glass placed horizontally in a shallow tray. A platinum wire, which constitutes one electrode of a Planté battery of fifty or sixty elements, is placed in the saline solution near one side of the tray. The other electrode, also of platinum, is surrounded, except at its point, with some insulating material, and serves as a pen for writing. Any characters traced upon the glass are found to be deeply etched upon its surface, and this is independent of the lightness and rapidity of the strokes. The action is both calorific and chemical. The chemical action of the current under these conditions is very powerful, the effects being greater than those produced by hydrofluoric acid. Either the positive or negative electrode can be employed for writing, but with the latter the current must not be so strong, and the marks are more distinct.

Another Great Engineering Scheme. — Some of our leading engineers suggest a plan for utilizing the vast water supply of the extreme northern part of the continent. By closing the northerly outlet of the valley of the Mackenzie River at the line of 68°, and thus storing up the water of 1,260,000 square miles, to which could be added the water of other large areas, a lake would be formed, of about 2000 miles in length by 200 of average width, which would cover with one continuous surface the labyrinth of streams and valleys which now occupy the Mackenzie Valley. It would prove a never-failing feeder for the Mississippi, and would connect with Hudson Bay and the Great Lakes, and also with the interior of Alaska through the Yakon and its affluents. The connection of the Upper Mississippi with Lake Mackenzie would be a comparatively easy matter, and a vast amount of navigable water-way would be added to this river. The formation of Lake Mackenzie would also contribute to the proposed ship canal from Cairo (Illinois) to the Gulf of St. Lawrence by the almost straight line which cuts the Wabash Valley, the Lakes Erie and Ontario, and the Lower St. Lawrence.

Talking a Hole through a Deal Board. — The following is from the London *Athenæum:* One day, at Menlo Park, Mr. Edison had been showing his phonographs and telephones to a friend, who at last remarked, in a kind of despair, "Mr. Edison, you had better invent a machine to talk a hole through a deal board." In a week the machine was complete, and may now be seen in the exhibition. It consists of a mouth-piece, with a diaphragm across it, to the centre of which a light steel rod with a ratchet at the end is attached. On being sung to, the diaphragm and the rod vibrate rapidly, and the ratchet, gearing into a little cog-wheel, causes it to revolve. The axle of the cog-wheel carries a minute drill. Many inventors may have had as many brilliant ideas, — few have carried out so many in actual practical form. The secret of Mr. Edison's success in this direction may be summed up in his own words: "Whenever by theory, analogy, and calculation I have satisfied myself that the result I desire is impossible, I am then sure that I am on the verge of a discovery."

The Action of Oxygen on Mercury. — It is currently believed that oxygen combines to a small extent with mercury at ordinary temperatures, but recent experiments of M. Amagat, communicated to the French Academy of Sciences, have demonstrated that when both these bodies are pure and dry they are without action upon each other, at least for a considerable time. The above error was introduced into science on the high authority of Regnault. M. Amagat arrived at his results by means of a Pouillet apparatus, having nitrogen in one manometer and oxygen in the other, with the metal in presence of both. Although kept for more than a month in the apparatus, the surface of the mercury in presence of the oxygen remained as brilliant as that in presence of the nitrogen.

Spectra of Fire-Flies. — During the past summer Mr. W. G. Levison, of Brooklyn, N. Y., has studied the spectra of the light of fire-flies and other light-producing insects. He finds that the ordinary small species of fire-fly gives a spectrum from which the blue and violet are omitted, and that in all cases examined the less refrangible rays predominate. Phosphorescent oils and glowing phosphorus give a spectrum consisting of green light only. A fire-fly that is injured and glows permanently seems to give a nearly similar spectrum, but the bright light given by the insect when living affords an entirely different spectrum, as mentioned above.

Nitrous Oxide as a Disinfectant. — The system employed at the Hôpital de la Pitié, in Paris, for disinfecting sewer gas by means of nitrous oxide is described in *La Nature*. The gas passes into an earthenware cylinder about four feet in height, filled with charcoal, sprinkled with nitro-sulphuric acid. The moisture contained in the gas condenses on the charcoal, setting free the nitrous oxide contained in the nitro-sulphuric acid, which destroys the sulphuretted hydrogen and all deleterious matters.

Improvement in Steamships. — The old Cunard steamship Persia was one of the finest steamships afloat, in her days; yet she required six tons of coal to carry a ton of freight across the Atlantic in her. To-day the steamer Arizona is carrying freight across the Atlantic with a consumption of only one fifth of a ton of coal to a ton of freight. It is mainly by the reduction in the quantity of coal consumed that we estimate the progress made in the improvement of steamers during the last forty years.

What is Sulphur? — Less than a hundred years ago this question was answered by Stahl as follows: Sulphur consists of oil of vitriol (sulphuric acid) combined with combustible essence. Sulphur can be made out of sulphuric acid, he said, by heating it with charcoal dust, because the latter contains the combustible essence or being. But this combustible essence had not been isolated and obtained in a free state, which seemed to puzzle some of the skeptics of that day, and led them to deny the existence of oil of vitriol in the sulphur.

Cosmical Hail. — M. Shevedoff, a Russian scientist, advances the remarkable hypothesis that hail is of cosmical origin, and captured by our world in its journey through space in the same manner that meteorites are attracted to our planet. He does not, however, explain why the heat generated when the hailstones strike our atmosphere does not melt them.

HOUSEHOLD HINTS.

A Strong and Handy Cement. — One of the strongest cements, and very readily made, is obtained when equal quantities of gutta percha and shellac are melted together and well stirred. This is best done in an iron capsule placed on a sand-bath, and heated either over a gas-furnace or on the top of a stove. It is a combination possessing both hardness and toughness, — qualities that make it particularly desirable in mending crockery. When this cement is used the articles to be mended should be warmed to about the melting point of the mixture, and then retained in proper position until cool, when they are ready for use.

Earache. — In the American Medical Association, Dr. Jacobi remarked that closing the mouths of infants and children, and simply blowing into the nose, is often a very valuable method of relieving severe earache, and that in a number of cases he had obtained most excellent results from this procedure, the cause of the trouble probably being a catarrhal affection of the Eustachian tube.

Syringing the Ear. — Let it be laid down as a rule from which there is to be no departure, says the *Atlanta Medical and Surgical Journal*, that no ear should be actively syringed unless there is something in it which it is important to remove. Cold water should never be put into the ear.

Pimples on the Face. — Dr. Gage Parsons recommends to dust the face with pure precipitated

sulphur every night with an ordinary puff used for toilet purposes. If the sulphur be scented with oil of lemon or rose it will form an elegant cosmetic.

Practical Chemistry and the Arts.

INDICATORS FOR ALKALIMETRY.

In volumetric analysis, when it is desired to determine the strength of a given acid by ascertaining how much normal alkali is required to saturate it, or the reverse, it is necessary to employ an indicator which shall mark the neutral point. It is not our design to add to the list of substances proposed for that purpose, but to enter into a critical examination of those now in use. The most common and one of the best is

LITMUS.

It comes into the market in small cubes, of a blue color, which contain an excess of alkaline carbonate. It is best prepared for use as an indicator by first extracting three or four times with strong alcohol, which removes a peculiar coloring matter that would interfere with its use as an indicator. It is then extracted with cold water, filtered, and enough acid added just to neutralize the alkali in it. It keeps its color best when left uncorked in half-filled bottles. With caustic alkalies it forms a deep blue color, that changes suddenly to an onion red when an excess of acid is added. If, however, carbonates are present, the blue changes to a purple before the alkali is saturated, and the change to red is uncertain. For this reason carbonated alkalies must be titrated hot, and the liquid boiled between each successive addition of acid as the neutral line is reached. With this single drawback litmus is an excellent indicator. There are cases, however, where neutral salts (those in which all the hydrogen of the acid is replaced by metals) give an alkaline reaction with litmus. This is the case with sodic acetate.

COCHINEAL.

These are small bugs which grow on a species of cactus in Mexico. The solution is prepared by digesting three grams of cochineal bugs (whole) in 250 cc. of dilute alcohol, made by mixing three or four parts of water with one of alcohol. The solution is acid to litmus, and must be carefully neutralized. It has a deep carmine red color in alkaline solution, which changes to yellow when acid is added in excess. It is much better adapted to the titration of alkaline carbonates than litmus. It is not affected by weak acid, and hence cannot be used in determining acetic acid. The results obtained in titrating alkalies with litmus and with cochineal do not agree perfectly; hence the same indicator must be used in standardizing the solution as will be employed in the analysis.

CORALLINE.

This substance is easily prepared in the laboratory by heating a mixture of one part oxalic acid, crystallized, one and one half parts carbolic acid, two parts concentrated sulphuric acid, for five or six hours on an oil bath at 140° or 150° C. To prevent loss, a long upright tube may be inserted in the cork to act as a return condenser. The resulting mass is poured into water, when the coralline is precipitated as a resinous mass. It is but slightly soluble in water, yet imparts to it a deep yellow color. If enough alkali is added to this liquid to change it to a deep red, it may be used at once without purification.

To insure neutrality in the indicator and guard against possible error, the following method may be employed with this as well as other indicators: Take about 100 cc. of water, and add to it a drop of alkali and enough of the indicator to impart to it a deep red color. Having filled the burette with one tenth normal acid to a point somewhere *above* the zero mark, let one drop fall into this 100 cc. solution; if it does not change add a second drop, and a third if necessary. The change is very marked and sudden. Divide this solution into two nearly equal parts in beaker glasses of the same form and size. To one add the alkaline solution that is to be tested, and to the other the same volume of distilled water: the former becomes intensely red; the other should remain unchanged. Now allow the one tenth normal acid to flow into the red solution until its color is precisely the same as that in the other beaker glass, namely, yellow. The delicacy of this reaction is all that can be desired, and it is especially preferred to litmus for determining the strength of acetic acid, since neutral sodic acetate does not color it red. For alkaline carbonates it is inferior to cochineal, for just at the point where litmus turns purple, coralline changes to an orange, which passes gradually into yellow.

NITRO-PHENIC ACID

is recommended by Langbeck as an indicator. This substance, generally known as mono-nitro-phenol, sells in Berlin at $12 per pound, and is not in the market here. It can be made in the laboratory by the action of dilute nitric acid on phenol (carbolic acid). Mix together 200 grams of nitric acid, sp. gr. 1.340, and 400 grams of water. The mixture has a gravity of 1.104 = 14° B. Place the vessel containing the acid in another filled with snow or ice water, and add slowly, with constant stirring, 100 grams of crystallized carbolic acid. Pour the mixture into cold water; a heavy black oil settles beneath a red acid liquid. Separate by means of a separating funnel, and wash well. This oil contains both the ortho and para nitro-phenol. It is placed in a large flask half full of water, and a current of steam passed through it. The ortho-nitro-phenol is carried off by the steam, and can easily be condensed in the usual manner. When the steam ceases to carry off any more nitro-phenol, the operation can be interrupted, and the tarry mass in the flask repeatedly boiled out with water, which extracts from it the para-nitro-phenol. By recrystallization from boiling water it is obtained in long white needles that melt at 110°, and forms a deep yellow salt with the alkalies. The ortho compound melts at 45°, is very slightly soluble in water, and yields a red salt with alkalies. Either of these may be employed as an indicator, but the ortho compound is preferable. The solution is of a deep yellow color when alkaline, but loses its color when acid. It may be used for acetic acid and for carbonates.

PICRAMIC ACID.

This acid was proposed as an indicator by Trébault, but our own experience with it has not been entirely satisfactory. It is easily prepared by dissolving picric acid in alcohol, adding an excess of ammonia, and then saturating the solution with hydrosulphuric acid gas. It is red in alkaline, yellow in acid, solutions.

PHENOLPHTHALEINE.

This substance was discovered in 1871 by Professor Baeyer, who obtained it from the action of sulphuric acid upon a mixture of phenol and phthalic anhydride. In 1877 E. Luck suggested its use as an indicator, and since it has become a commercial article (at $2.50 per ounce) it seems to have met with much favor among chemists. One part of the phenolphthaleine is dissolved in thirty parts of alcohol, and one or two drops of this solution are added to the substance to be tested. In neutral and acid solutions it is colorless, but a trace of alkali changes it to a beautiful rose color. The change is sudden and very easily seen, but we fail to discover its great superiority to coralline. It does not work well with the carbonates, and this is attributed by Vielhaber to the formation of a bicarbonate which does not affect this indicator. Results obtained with potassium carbonate, as will be seen below, differ about fifty per cent. from those got with other indicators. With acetic acid this indicator agrees very closely with coralline.

SALICYLIC ACID.

It is well known that the beautiful violet color produced by the action of salicylic acid upon salts of iron is destroyed by acids, and changed to a yellow by alkalies. Weiske proposes to make use of this property in alkalimetry, but we believe it is useless as an indicator.

Fluorescene and many other substances have been recommended, but as we set out to give merely the result of our own observation we pass them by.

For the purpose of comparing the various indicators we made up a dilute solution of caustic potash, of unknown strength, and then proceeded to titrate it with a one tenth normal sulphuric acid solution, taking 5 cc. of the former for every experiment. The quantity of acid required is given below; each test being repeated three times.

	I.	II.	III.
Litmus	16.50 cc.	16.55 cc.	16 60 cc.
Cochineal	17.25	17.25	17 15
Coralline	16.60	16.65	16.60
O= Nitro-phenol	16.65	16.55	16.50
Picramic acid	16.70	16.30	16.30
Phenolphthaleine	16.40	16.45	16.40

Tests were also made with 5 cc. of a potassium carbonate solution. The quantity of acid consumed was as follows: —

	I.	II.
Litmus	4.5 cc.	4.4 cc.
Cochineal	4.7	4.8
O=Nitro-phenol	4.4	4.2
Phenolphthaleine	2.4	2 5

Ordinary acetic acid diluted with water was then titrated with one tenth normal alkali; 5 cc. of the former required as follows of alkali: —

	I.	II.	III.
Litmus	19.70 cc.	19.75 cc.	19.70 cc.
Coralline	20.15	20.20	20.10
O=Nitro-phenol	20.00	19.90	20.10
Phenolphthaleine	20.30	20.40	

It will be seen that coralline and phenolphthaleine are best adapted to testing the strength of acetic acid, but nitro-phenol can be used if care is taken to continue the addition of the alkali until a *deep* yellow color is reached. For general use, cochineal and coralline are quite sufficient.

It has been claimed by Siegwart that caustic alkalies could be determined in the presence of

their carbonates by the use of turmeric paper, but this is apparently a mistake, as the difference in the color produced by each, when dilute, is very slight.

SPECIFIC GRAVITY OF ETHER.

TABLES have been constructed which show at a glance the percentage of anhydrous ether corresponding to the specific gravity taken at 60° Fahrenheit. In warm weather, and in a warm room in winter, it is sometimes inconvenient to cool the ether down to the standard temperature. In such cases it is only necessary to take the specific gravity at any convenient temperature, the temperature being found by suspending an accurate thermometer in the ether, and adding to the reading 0.003 for every five degrees of temperature above 60°, or about .001 for every two degrees Fahrenheit. Thus we find a sample of sulphuric ether to have the following density, as shown by a good hydrometer at the temperatures given: —

At 60° Fahr.	. . . .	spec. grav.	0.730
65	"	" "	0.727
70	"	" "	0.724
75	"	" "	0.721
80	"	" "	0.718

If a Centigrade thermometer is employed, the correction will be very nearly 0.001 for each degree above 15° C. Thus, if the gravity taken at 20° C. is found to be 0.725, the true density at 15° C. is 0.730.

The slight errors in the above method are less than the usual errors in reading the hydrometer, and the results are sufficiently accurate for all commercial purposes.

INDUSTRIAL MEMORANDA.

TESTS FOR STONES. — For purposes of the engineer, or in geological surveying, the physical character of a rock is of value. There are a few tests which it may be necessary to have recourse to. Mr. W. H. Penning, F. G. S., says: "To ascertain the kind of rock exposed in a pit or quarry, a fragment is detached from that part which has been least altered by the action of the weather. A good-sized piece of the rock is broken off, and afterwards reduced by chipping into a square lump. Good edges are thus obtained for observation of its texture by the aid of a pocket-lens." Scratching is a tolerably good means of testing hardness, and the young architect or geological student might examine the hardness of the stones in any locality with the aid of his pocket-knife. Those which are easily scratched effervesce rapidly with dilute hydrochloric acid; and generally the degree of durability of a stone may be ascertained by the rapidity or slowness of effervescence. Calcite, or carbonate of lime, limestones, etc., are easily scratched, and effervesce rapidly under acid. Magnesian limestone and dolomite do not effervesce quickly, and many sorts of stone, like gypsum sandstone, do not effervesce at all. Other important tests may be resorted to if additional information be required, and the texture and color are important for the architect. Texture is discovered by chipping an angle, and this may be crystalline, earthy, fibrous, granular, or compact. The behavior of a stone before the blow-pipe is another valuable test: some stones reduce to quicklime, as those in which carbonate of lime is the chief constituent; others are fusible more or less, and some yield copper, lead, glass, slags, etc. It would be as well if these simple means of testing were more generally known and exercised in the selection of building-stones.

CHINA INK. — This ink is known to consist chiefly of lamp-black made into cakes with some binding material. Dr. Precht, of Stassfurt, says the lamp-black is got by burning different oils, with limited access of air; the quality depending partly on the raw material, partly on the kind of oven used. The inferior products are applied in printing. As binding material, the Chinese often use the sap of various plants; but it has been ascertained that the black ink contains only animal gelatine, and no gum arabic. The usual addition of camphor and musk does not affect the goodness of the ink. In making the black ink, the drying mixture (which is compounded according to precise rules) is carefully watched. Most of the China ink sold is imported from China; but some German houses make the ink, and of excellent quality. China ink used in drawings (which often receive water-colors) should be highly insoluble in water. It is seldom so; but, according to Dr. Precht, if bichromate of potassium (say, a two per cent. solution) be used instead of water in the rubbing process, the drawing, after one or two hours' exposure in daylight, becomes resistant to water.

PAPER-HANGING ON DAMP WALLS. — A mode of hanging paper on damp walls has been patented in Germany. Lining-paper, coated on one side with a solution of shellac in spirit, of somewhat greater consistency than ordinary French polish, is hung with the side thus treated towards the damp wall. The paper-hanging is then performed, in the usual way, with paste. Any other kind of resin easily soluble in spirit may be used in place of shellac. A layer of paper thus saturated with resin is said to be equally effectual in preventing the penetration of damp. It is not stated how long lining-paper prepared in the manner described will adhere to a damp wall.

NEW USES FOR GLASS. — It is stated that Mr. Frederick Siemens contemplates adapting his toughened glass to street gas lamps, substituting glass for the iron pillars, and to water main pipes. These articles, it is claimed, are much stronger than iron castings, and imperishable and incorrodible. It is said that common castings, which are now procurable at prices which do not return the iron founder more than the barest profit, or none at all, can be produced in Siemens' glass at about twice the figure, giving ample profit to the manufacturer. As the specific gravity of glass is only about one third that of cast-iron, the purchaser will be able to obtain glass articles at about one third cheaper than similar goods in cast-iron, as he will get, say, three pipes for the weight of one cast-iron piece of main.

COTTON-SEED OIL. — According to reliable authorities, there are fifty-six cotton-seed mills, most of them situated in the southwestern portion of the United States. These mills use yearly about 410,000 tons of seed, which, after being cleansed from lint and husks and chopped very fine, are packed in woollen bags placed between horsehair mats, and submitted to hydraulic pressure. The expressed oil is either barrelled at once or treated with caustic soda, yielding about eighty-two per cent. of purified or "fine" oil. The total yield is about 15,000,000 gallons annually, of which it is stated about 10,000,000 gallons are sent to France, and there mixed with about one third of olive oil. This mixture is then shipped from France to all parts of the world.

PRACTICAL RECIPES.

TO MAKE BRICK-WORK IMPERVIOUS TO WATER. — According to the *Industrial World*, to make brick masonry impervious to water, there may be employed two washes or solutions for covering the surface, the one Castile soap and water, the other alum and water: the proportions being three fourths of a pound of soap to a gallon of water, and a pound of alum to four gallons of water, both being well dissolved. The wall must be perfectly clean and dry, and the air at least 50° F. The soap wash should be laid on boiling, with a flat brush, and so as to form no froth. After remaining 24 hours to become hard, the alum wash is applied in the same manner, but at a temperature of from 60 to 70°. After another 24 hours a second soap wash is put on, this being repeated until the walls are impervious.

BLACKING BRASS. — A correspondent of the *English Mechanic* says: I have tried all the various recipes recommended, — nitrate of silver, platinum bichloride, etc., — but never found any work so satisfactorily and cheaply done as by the reduction of nitrate of copper to the oxide. I find the best way of using is to apply the solution to the brass to be blacked with a camel-hair brush, previously slightly heating the metal; then to raise the heat until the requisite color is produced; finishing by rubbing with a soft rag, and either oiling or lacquering. I can confidently recommend this as the very best method of producing that good black seen in first-class optical goods; observing that the process will not do for soft-soldered articles, as the heat necessary to produce the black is greater than the melting-point of soft solder.

CLEANING LIME-ENCRUSTED PIPES. — A correspondent of the *American Manufacturer* writes: "As a sort of 'shop kink' I give you a curious experiment tried on an engine water-supply pipe that had become choked up with lime encrustation. After hammering it for an hour or two, and kindling a fire all over it, without any result, one end was plugged up, and about a pint of refined coal oil was poured in the other, — all it would hold, — leaving it to stand all night. The next morning the entire mass slid out, a solid lime core. Before trying this we thought of throwing the pipe away as useless, and getting a new one."

CEMENT FOR TIN AND GLASS. — The following, which has been recommended for joining the metallic to the glass parts of kerosene lamps, is impermeable to all oils: —

Caustic soda	1 ounce.
Water	5 ounces.
Resin	3 "
Plaster of Paris, sufficient	

Make a solution of the soda in the water, and boil with the resin until this is dissolved. To the liquid add half its weight of plaster, and apply immediately. It sets firmly in half to three quarters of an hour.

PAPER FOR SILVER-WARE. — The *Archiv der Pharmacie* gives the following formula for making paper for wrapping up silver: Six parts of caustic soda are dissolved in water until the hydrometer marks 20° Baumé. To the solution add four parts of oxide of zinc, and boil until it is dissolved. Add sufficient water to bring the solution down to 10° Baumé. Paper or calico soaked in the solution and dried will effectually preserve the most highly polished silver articles from the tarnishing action of the sulphuretted hydrogen which is contained in such notable quantities in the atmosphere of all large towns.

MISCELLANEA.

REVISION OF ANALYTICAL METHODS. — *Le Moniteur Scientifique* says that the Central Society of Chemical and Commercial Industries has nominated a commission for the revision of the analytical processes used in determining the value or the purity of commercial products.

HOW WE CUT GLASS. — In our November number we gave the formula for making carbon pastils to cut glass. In our laboratory we usually employ a large knitting needle or stiff platinum wire, which is kept hot by holding it in a gas flame. A file-mark is made to commence the cut, and the vessel to be cut off is supported or held as near as possi-

ble to the flame. One end of the needle is heated to a bright red in the flame, then passed through the flame until it touches the glass about half an inch or less from the file-mark. By keeping the needle in the flame it remains very hot, and the crack will follow the needle after a few seconds. If the end of the needle gets too cool, it may be brought into the flame again, but the conductivity of iron for heat is such as to keep the end that is only half an inch from the flame very hot. Holes may be bored into a beaker or flask by first warming the spot, and then pressing the hot needle end against it and boring into it. To insure a crack instead of a perforation, the vessel to be cut must be kept quite cold during the operation.

CHLORAL. — The tendency which liquid chloral has to pass into the solid form, or metachloral, can be overcome, according to Byasson, by shaking it with a little caustic baryta. The presence of a trace of sulphuric acid is the cause of its disagreeable polymerization.

PREPARATION OF COCAINE. — Coca leaves are extracted with ether, and the greenish black percolate evaporated to dryness. The residue is shaken with warm water, which dissolves the alkaloid, but leaves the waxy substances behind. The solution is treated with magnesia, filtered, evaporated to dryness, and dissolved in amyl-alcohol, from which it crystallizes out in yellow crystals.

ANALYSIS OF ELEPHANT'S MILK. — According to Dr. Charles A. Doremus, the milk of the elephant has the following composition: —

Water	66.693
Fats	22.070
Casein	3.212
Sugar	7.392
Ash	0.629
	99.996

GLUCOSE IN PHARMACEUTICAL PREPARATIONS. — Charles B. Allaire, in a paper read before the American Pharmaceutical Association, detailed his experiments in the substitution of grape sugar for cane sugar in the officinal syrups. He reports such substitution unsatisfactory: first, from its lack of sweetness, grape sugar fails to mask the taste of drugs; and secondly, the syrups are more liable to mould and ferment.

SUGAR OF MILK. — In 1880, the value of sugar of milk imported into this country exceeded twenty-five thousand dollars. Is it not about time that some of our large cheese factories undertook the manufacture of sugar from the whey, which yields about five per cent. of this substance?

SOLUBLE CARBONATE OF IRON. — M. J. Ville has been experimenting upon the solubility of carbonate of iron in water saturated with carbonic acid, and finds that at 15° C. (59° F.) 1.390 grams are dissolved in a liter of water. The quantity diminishes as the temperature increases; but it is probable that water saturated with carbonic acid under pressure will dissolve much more iron than above stated.

CARBONATE OF SODA. — In the manufacture of this salt from the sulphate the conversion may be effected by the use of trimethylamine and carbonic acid. The trimethylamine sulphate is treated with milk of lime, and used over and over again. The operation resembles Solvay's ammonio-soda process, the amines being simply organic ammonias.

VISCOSE. — Béchamp describes the gummy substance of viscous fermentation as a white substance, easily powdered, and not having the appearance of a gum. It dissolves in cold water, rendering it glutinous, like gum. It does not reduce the alkaline copper solution. It is entirely precipitated from solution by alcohol, as a mass which can be drawn into threads. It consists of 44.97 per cent. carbon and 6.26 hydrogen. It is not colored blue or violet by iodine. Sulphuric acid converts it into dextrine and glucose.

Agriculture.

A FARMERS' SCHOOL.

THE following portion of Dr. Nichols's Essex County Address is given here, at the request of some of our readers: —

I will endeavor to present a brief outline of a school of instruction for farmers which has been carefully considered, and regarded as practicable. To afford a clearer understanding, it may be assumed that a school has been established at Danvers, Andover, Salem, Haverhill, or some other convenient point, for the benefit of the farmers of Essex.

The building in which the school is held may be a hall, with convenient rooms attached, such as is found in several of the cities and larger towns; or it may be a building specially constructed, inexpensive but comfortable, with lecture-room, general meeting-room, and another which can be improvised for a laboratory. Two terms are held each year: one in June, at the close of the planting season, the other in December, and each continues during two weeks. The instruction is mainly by familiar, practical lectures, continuing one hour, and each fully illustrated by experiments, specimens, models, plants, seeds, etc., so as to convey to the eye as well as to the ear a clear understanding of the topic considered. They are scientific lectures, presented after scientific methods, differing only in the use of language. That is employed which is adapted to non-scientific minds. There are six of these lessons every day, and during the week of six working days there would be thirty-six lectures, and in the term of two weeks seventy-two.

There are six upon chemistry, elementary and applied, each lecture profusely illustrated by experiments; six upon the microscope, its use and application to husbandry. By means of the solar microscope and the electric lamp, most beautiful and instructive lessons are given. Six lessons upon fertilizers, domestic and commercial, illustrated by experiments in compounding and preparing for farm use, etc. Six lectures upon how plants feed, and how plants grow. Six lectures upon the history of soils, their origin, formation, etc. Six upon dairy products, milk, cream, butter, and cheese.

These comprise the course for the first week, summer term, and are presented as typical of the course and nature of the instructions imparted. The lessons begin at nine o'clock each morning, and the topics follow each other until twelve, noon. At two the lessons are resumed, and continue until five o'clock, P. M. The daily work is as follows: at nine o'clock, Chemistry; ten, the Microscope; eleven, Fertilizers; two P. M., How Plants Grow; three, Soils; four, Dairy Products. This arrangement gives variety and prevents weariness. Text-books may or may not be used, but each attendant is provided with book and pencil for taking notes, and during the lessons any one is permitted to ask questions, but no discussions are permitted.

One, two, four, or the whole course of lectures may be attended, as suits the inclination or convenience of the farmer. It is seen at a glance how many interesting and important topics are presented in a single week, appealing to the understanding through the eye as well as the ear. Extend them through another week, or over three more, during both terms, and changing the topics so as to cover a complete course in scientific husbandry, and consider what a vast amount of accurate practical information is afforded by this school, in the year, comprising only four weeks' instruction.

The instructors, four or six in number, are selected with special reference to their fitness for the different positions to be occupied. They are men of good common sense, having an aptness for popular instruction, and a competent fund of positive scientific knowledge, and also ingenious in illustrative experiments and in the use of apparatus. As regards funds for the support of such schools, they should be furnished by the State, and it could well afford to do so. Can any one doubt the influence of such schools upon real agricultural progress? The solid prosperity of the farming interests must be promoted by this higher education, and I believe they would be well patronized by working farmers, the class now so much neglected.

One body of teachers would supply the wants of the State, if schools were established in eight or ten different localities, as they could move from one to the other, having school terms in different months of the year. These schools would be for the benefit of the youth as well as for middle-aged men; the farmer and his sons would attend them in winter, and, doubtless, in summer, for the attractions and advantages would be so great that no ordinary hindrances would be allowed to stand in the way.

For several years I have entertained the design of endeavoring to secure the establishment of a school of husbandry for the benefit of the husbandmen of Essex County, on the plan which has been outlined, and the barn-floor lecture, given in my farm barn in 1878, at which many of you were present, was but an experiment to test the feasibility of the undertaking. The success of that homely effort dispelled all doubt of the wisdom of the plan, and it would have been carried out at once had not failing health and a pressure of business, public and private, prevented. I still hope to be able to aid in such an important enterprise, and that the time is not very remote when the school will be in active progress.

Our agricultural colleges, of which there is but one in any State (however generally useful they may be), do not meet the needs of practical agriculture; and neither do the agricultural schools in Europe, although better than ours, and far more numerous. In England, the famous college at Cicencester has proved a complete failure, and the same may be said of most of the other schools. *France* has 43 schools of agriculture, with about 30 pupils in each. The government pays the board of each pupil, and allows him 70 francs a year for clothing. *Germany* has 150 schools of agriculture, arboriculture, and viniculture; each has farms and gardens attached. *Austria* has 70 schools, with 2200 students; but, better than all, she has 174 agricultural *evening* schools, with 5500 students. Italy is in advance of most European countries in its provisions for agricultural education, but it must be understood that none of these comprehend the idea of educating the workingmen on the farms. In this they are defective, and satisfactory results will not be realized until radical changes are made.

BRIDGEWATER MEETING OF THE STATE BOARD OF AGRICULTURE.

THIS meeting, held on the 6th, 7th, and 8th of December at Bridgewater, may be regarded as among the most successful ever held by the board. The weather was very favorable, being warm and pleasant, except for a part of Wednesday, the second day. The papers were of a high order, and the attendance was unusually large.

The papers by Colonel Moore, of Concord, upon "The Management of Mowing Lands," by Mr. Cheever, of the *New England Farmer*, upon "Growing and Feeding Forage Crops," and by Mr. Faxon, of Quincy, upon "Silos," were specially interesting and important, and will be looked for in the forthcoming State report of the secretary. Dr. Nichols, of the JOURNAL, lectured on Tuesday evening upon "The Sugars," and read a paper on Wednesday upon "The Nature of Swamp Muck, and its Use in Agriculture." This paper gave the results of an extended lab-

oratory investigation of muck, and of its trial on soils under many conditions. It has been published in the *New England Farmer*, of this city, and will appear with some additions in the State report.

HOW PLANTS GET THEIR NITROGEN.

A SERIES of experiments with certain cultivated plants was lately made by Herr Weiss, with reference to the comparative value of manuring with nitric acid and with ammonia. The plants were grown in pots in a soil of artificial humus, and received, besides the necessary mineral salts, either no nitrogen, or nitrogen in various forms. Herr Weiss's results are as follows: —

(1.) There are plants which in the first period of life can take nitrogen only as nitric acid, and others which can take it only as ammoniacal salt. In the second life-period, nitric acid must also be furnished to all plants. (2.) Buckwheat, oats, peas, beans, and Soja beans are proved to be nitric-acid plants, while maize and tobacco are ammonia plants. (3.) The poppy is probably an ammonia plant, but barley, rape, and potatoes are probably nitric-acid plants. (4.) In general it will be found more advantageous to manure with nitrogen in the form of nitre (in the case of ammonia plants, naturally not). If ammonia salts are used, they should be applied in autumn.

The assimilation of nitrogen by plants has also been carefully studied by Signor Lamattina, of Rome, who arrives at the following results: —

Plants absolutely require to assimilate nitrogen, and they obtain it in three forms: (1.) In the nitrates of the ground. (2.) In the ammonia of the air. (3.) In the state of protoxide in the atmosphere. The nitrogen in the state of nitrates, absorbed by the roots, is for transport and diffusion of mineral substances, principally potash, in the leaves, helping to form chlorophyll and hydrocarbons. The nitrogen absorbed in the form of ammonia by respiration serves for formation of albuminoids, fibrine, etc. The nitrogen absorbed in the state of protoxide appears to serve as complement of the food of the plant, acting both as corrective, by neutralizing the bases in excess, and helping in the formation of alkaloids. Preponderance is given to one or other of these three forms of absorption, by climate, family, etc.

THE SOIL AS A LABORATORY.

THIS topic is pleasantly and instructively treated in the following extract from one of President Chadbourne's "Familiar Lectures" in the *Springfield Republican*: —

Nearly all the substance in a good soil is crude material for plant food, though it is not found in the proportions in which it is commonly required by plants, and but very little of it is at any one time in a fit condition for their food. Silica, the most abundant substance in ordinary soils, is but sparingly used by plants, and alumina or clay, another abundant substance, is perhaps not used at all as food by our agricultural plants. Whatever substances are taken by the plants must be in a soluble condition, and the soil is a laboratory in almost constant operation, dissolving and combining its own materials, so that they can, from year to year, be taken up by the plants. Only a very few soils will furnish these materials for a series of years, as fast as ordinary crops remove them. Hence the need of applying fertilizers to the soil.

Common soil, as we have already seen, consists of pounded rock and the organic matter that has slowly accumulated in it. If a single element essential to plant growth is wanting, then the soil will remain barren till that is applied. But supposing all the elements required for plants are found in the soil, then the only condition required to secure fertility is that these elements shall be brought in contact with the roots of plants in that condition in which plants feed upon them. A fertile soil is a chemical and physical laboratory for producing just this result. In dissolving and moving the material, wonderful operations are daily going on in field and forest, — operations as interesting and wonderful as those that astonish us in the chemical lecture-room.

The physical condition of the soil modifies the chemical action within it. Some of its physical conditions, therefore, require consideration. And first, the fineness of a soil is an important condition as favoring fertility. Decomposition of the mineral constituents of the soil can take place only on their surfaces. The more surface the more chance for decomposition; and the finer the materials the more surface do they present for action, as can be readily shown by experiment. We cannot cut or break any solid substance without increasing the surface of the whole. A cubic foot of granite has, while a cube, 864 square inches of surface. If it is cut into six-inch cubes, the whole mass will have 1728 square inches of surface, and so on indefinitely; the surface of the whole is increased by every cut or fracture. When the mass is reduced to the fineness of mineral matter in our best soils, the amount of surface from a cubic foot is far beyond what any one would suppose who had not made such calculations. This fine soil, then, other things being equal, most rapidly yields its materials for the food of plants. But there must be moisture and air to favor this decomposition, and therefore a soil that is very fine, especially if it contains alumina or clay, may prevent the movement of water, and its particles may thus be protected from all chemical action, when they will be as useless as they were in a solid mass.

The decomposition of organic matter also favors decomposition of mineral matter in contact with it. The decomposition of organic matter is promoted by heat, and, in general, the darker the soil the warmer it will become when exposed to the sun. The heating of light-colored sands is accounted for by their good conducting power, but in ordinary soils a dark color increases the heat, so that the plant is stimulated directly, and decomposition promoted to furnish it with food. The roots of growing plants have also a direct action upon minerals in the soil. That is, they begin to prepare their food before it is taken into their tissues. So we have the combined action of water, air, heat, organic matter, and the roots of living plants, all working together in the laboratory of the soil, producing decomposition of mineral matter directly, and producing various compounds, that indirectly produce the same result.

GLEANINGS.

EFFECT OF ALKALINE CHLORIDES AND NITRATES UPON THE SOIL. — Tuxen has been investigating the action of various salts upon the soil, and has found that Chili saltpetre (nitrate of soda) and common salt weaken the power which the soil possesses of absorbing potash and ammonia, while on the other hand they increase its ability to take up phosphoric acid. The potassium salts possess these properties with regard to ammonia and phosphoric acid in a still higher degree. Chili saltpetre and common salt dissolve the combined potash and the phosphoric acid in the soil to a much greater degree than water alone.

FISH-FARMING. — An acre of water may be made more valuable than an acre of the best farming land. Here is an instance in point: A gentleman in Sonoma County, California, has this year sold $700 worth of carp from a pond covering less than an acre. He has had the fish but two years. If you have a pond of water, utilize it; if an undrained slough, make a pond by excavating.

Boston Journal of Chemistry.

JAS. R. NICHOLS, M. D., *Editor.*
WM. J. ROLFE, A. M., *Associate Editor*

BOSTON, JANUARY 1, 1882.

BOSTON WATER.

THE views presented regarding the cause of the bad condition of the water supplied to this city, in the December number of the JOURNAL, were in print before the report of Professor Remsen was made to the city government, and hence were based on no information obtained, or researches made by him. It was stated in the article that the evil had its origin in *animal*, and not in vegetable sources, and this view is sustained by Professor Remsen's investigations. These investigations, however, do not in their results harmonize all the facts, or shed satisfactory light upon the problem in many of its more obscure aspects.

The *fresh-water sponges*, to the growth and decay of which are attributed the odor and taste of Boston water, are among the lowest forms of animal life, and are endowed with those characteristics which distinguish animal from vegetable life; and in their living forms, and in their decay after disintegration, are capable of exerting an influence upon waters which foster their growth very different from that of any vegetable organisms known to science.

Whilst it is probable that the theory of Professor Remsen accounts in part for the origin of the evil, it does not meet all the facts involved in the problem. The cucumber flavor and fishy taste is found in many pond waters where none of the lowest forms of animal life exist, and this condition has occurred oftener in the dead of winter and late in spring than in summer, when growth, decay, and death in the organic world are the most active. In twenty-one of the thirty past years in which this condition has been observed in Kenosa Lake, Round and Plug Ponds, in Haverhill, Mass., seventeen of the instances have occurred in the winter and spring months. There is not probably a single small lake or pond in the New England States which is not at times affected to a greater or less extent by the same bad odors and taste observed in the Boston water. In large lakes like Winnipiseogee, Sebago, Champlain, etc., it is unknown. In rivers and brooks it is also unknown. In Kimball's Pond in Merrimac, Mass., Chadwick's Pond in Boxford, and Country Pond in Newton, N. H., it has been observed. None of these ponds supply water to towns or cities, and they are free from muddy deposits and aquatic plants. All of them, however, abound in fish of the usual varieties.

Farm Pond, from which a portion of the city's supply is taken, and which is found to be the source of the contamination, is situated in a low basin, and the bottom is covered with a heavy deposit of mud. This pond, like others, abounds in small fish, and the mud banks are full of fresh-water eels. The pond has been stocked with black bass within a few years, and fishing has been prohibited. Lake Cochituate, being a larger body of water, is not so readily brought under influences promotive of the evil, and yet in 1854–55, if we mistake not, it was very bad. As many as five or six times in the past quarter of

a century it has, to a limited extent, afforded the fishy, cucumber taste and smell.

Twenty-five or more years ago, when the trouble became so great as to lead the city government to appoint a commission to investigate it, we joined the gentlemen in some of their expeditions to the lake, and to other bodies of water, and thus became greatly interested in the problem. With the view of ascertaining the influence which fish might exert upon the waters of ponds in some morbid states, occasioned by imperfect aeration, consequent upon drought or low stages of water, a large tank was erected, into which a considerable number of fish were introduced. Connected with this tank was a supply of water under pressure, so arranged that its flow could be easily controlled.

It was found that so long as a copious supply of water was furnished, the fish were healthy and very voracious, the pickerel preying upon the smaller fish to such an extent as made frequent replenishing necessary; and the water of the tank was sweet and good. Upon diminishing the flow, in a few days the fish became inactive, their appetite failed, and in the course of a week or two the whole body was covered with a flocculent, slimy membrane, which communicated to the water the intense cucumber odor and flavor noticed in the city supply from Farm Pond, at the present time. A bit of this covering removed and placed in a tub of fresh water instantly permeated the whole mass, and a piece no larger than a thumb-nail was sufficient to contaminate a barrel of water, so disgusting and pervasive was its odor. Under this condition of the fish, when the faucet was opened to admit a full flow of water, in a day or two decided improvement was observed: the fish became active and hungry, and in a week the slimy coating sloughed off, and floated in the water, giving it an exceedingly unpleasant odor so long as it remained.

This experiment was repeated several times, with like results; and indeed, in the conduct or management of aquariums the same phenomena have been often observed. If we regard Farm and other ponds as but great aquariums stocked with fish, we have only to introduce the factors of diminished or inadequate water supply to bring about conditions corresponding with those in the experimental tank. This, indeed, is the condition we have observed in several ponds. The deep basins in which the fish congregate in time of drought have been found to contain the most offensive water, and a distinct line of this water could be traced to the outlet in the ponds. If this view of the cause of the offensive taste is correct, it may be assumed that upon the inflow of the late or early fall rains into a pond the morbid coating of the fish is cast off, and contaminates the water.

It is by no means improbable that the water of Farm Pond is contaminated to some extent by the presence of living or dead sponges, but it is highly probable that the morbid condition of fish, consequent upon imperfect aeration of water, is another and prominent source of the evil.

Master. "What does Condillac say about brutes in the scale of being?" *Scholar.* "He says a brute is an imperfect animal." *M.* "And what is man?" *S.* "Man is a perfect brute."

THE METRIC SYSTEM.

We fear that the metric system is making but slow progress in this country outside of strictly scientific circles. The generality of people — even of well-informed, not to say cultivated people — do not seem heartily interested in promoting its adoption for the purposes of common life, and comparatively few of them have mastered its nomenclature and its familiar equivalents. A recent letter from an old subscriber is full of praise for the JOURNAL as "a medium for popularizing science," and the only fault he has to find with it is that it "sometimes gives metric weights and measures without explaining them." We have rarely done this, except in articles or notes for practical chemists, though the avoirdupois weights of the gram and the kilogram, and the length of the meter in feet and inches, have been given hundreds of times in our columns. We suspect that few even among scientific students become so familiar with the system that they *think* in metric forms, unless they are compelled to make daily practical use of them.

The following directions for a "translation" of metric weights and measures, which we take from Oldberg with some slight modifications, are accurate enough for popular purposes, and easily remembered and applied: —

To convert avoirdupois pounds into grams, multiply by 500 and deduct 10 per cent. (The answer for weights by this rule will be too small by $55\frac{1}{2}$ grains — about — for every 1000 av. pounds.) To convert grams into avoirdupois pounds, add 10 per cent., and divide by 500. (The answer for weights by this rule will be too small by about one fourth of one per cent., or $32\frac{1}{8}$ grains for every 1000 grams.)

To convert avoirdupois pounds into half kilos., or pints into half liters ($\frac{1}{2}$ liter = 500 cc.), deduct 10 per cent.

To convert half kilos. into avoirdupois pounds, or half liters into pints, add 10 per cent. For error, see above.

To convert avoirdupois ounces into grams, multiply by 30 and deduct 5 per cent. The answer will be too great by $2\frac{1}{4}$ grains for every ounce.

To convert grams into avoirdupois ounces, divide by 30 and add 5 per cent. The answer will be too small by nearly 3-10ths of one grain for each gram.

To convert yards into meters, deduct 10 per cent., and to convert meters into yards, add 10 per cent.

The following approximate quantities may be found useful to the dispenser: —

One troy grain (or minim) is equal to 0.065 gram (or fluigram), or $6\frac{1}{2}$ centigrams.

One drachm (or fluidrachm) is equal to 4 grams (or fluigrams).

One troy ounce is equal to 31 grams; one fluid ounce is equal to $29\frac{1}{2}$ cc. or fluigrams.

One gram is equal to 15 grains (or minims).

The average "drop" is equal to 0.05 fluigram.

An average teaspoon holds 5 fluigrams; a dessertspoon, 10 fluigrams; a tablespoon, 20 fluigrams; and a wine-glass, 75 fluigrams.

"Drops" and "spoonfuls," however, as we have before shown, are unreliable measures, and their use is never to be recommended.

UNDERGROUND TELEGRAPHY.

With the increased number of wires brought into use by the introduction of the telephone, the necessity of burying them is becoming more and more evident. Abroad it has been the custom for years to put down telegraphic cables, not in cities only, but from town to town. In London there are 4388 miles of underground to 500 miles of overhead wires within four miles of St. Martin's-le-Grand. The overhead wires have been reduced from 1720 to 500 miles during the past four years.

In Chicago, notice has been given to the telegraph and telephone companies that after a certain date no wires will be allowed on posts or house-tops in that city. Philadelphia and Washington are to have underground telegraphs, and Boston ought to have.

One of the principal objections to underground telegraphy has been the expense of making suitable insulated cables. We have recently been shown an insulated telegraphic ribbon which promises to remove this objection to a certain extent. The simplicity of its construction causes surprise that it was not thought of before. In the sample before us are six copper wires placed parallel to each other, at a distance of one fourth inch apart. A strip of rubber about two inches wide is placed on either side of the wires, and the whole passed through grooved rollers, which cause the rubber to adhere between each wire and on the edges. This not only prevents contact between the wires, but insulates them perfectly from the surrounding objects.

The rubber employed in making these cables contains a large amount of graphite, or plumbago, and, strange to say, this substance, which is by itself a conductor of electricity, becomes an excellent insulator when incorporated into the rubber. The wires are tinned to prevent the sulphur from destroying them, but it has been proposed to overcome this difficulty by employing sulphide of antimony instead of sulphur for vulcanizing the rubber. If it should be found that the induced currents cause trouble, it will only be necessary to attach a strip of tin foil to one side of the ribbon.

The Mutual Union Telegraph Company has purchased the right to use this cable, and we understand that the first practical test of it is to be made in Washington, D. C., where the cable is to be put into the sewers.

In Japan, it is said that the spiders ground the wires, so that it is necessary to employ persons to sweep off the webs continually. In winter, ice accumulates on the wires, breaking them down; in summer various other accidents threaten the wires, especially storms and fires; and even kite-tails and hoop-skirts are a nuisance on the wires. In thunder showers the elevated wires become dangerous, as collectors and accumulators, as well as conductors, of atmospheric electricity.

Underground telegraph wires are being laid in New York between the police and fire department offices. In laying the wires an excavation is made to the depth of two feet. A wooden trough is laid down, and in this the wires are placed, immersed in a composition which, it is claimed, perfectly insulates them. This composition is a mixture of powdered glass, paraffine wax, resin, and linseed oil. It is melted and poured in hot, and when it solidifies it is a tough, hard composition, impervious to moisture and unaffected by changes of temperature. It will bend without breaking, and cannot be broken by the shifting of the earth or settling of the street bed. The wooden trough is simply a

mould, which may rot away without affecting the efficiency of the cable. Instead of the ordinary galvanized iron wires of above-ground telegraphy, the wires used in the underground system are of copper, with two coverings of cotton fabric soaked in paraffine wax. In placing the wires a half-inch layer of the insulating composition is first put in the trench; then eight wires are put down, three eighths of an inch apart; then come another half inch of the composition and eight more wires; and so on, until the 72 are inclosed in a rectangular cable 6½ inches wide and 3½ inches thick.

WHAT IS SAID ABOUT THE JOURNAL.

It may, perhaps, seem egotistical for us to publish the praises poured out upon the JOURNAL, yet we hope to be pardoned for trying to "see ourselves as others see us." A few days since we received a letter from a doctor eighty years old, away up in Vermont, enclosing a dollar to continue his subscription "as usual."

A gentleman in Camden addresses us as "Dear Friend," and adds: —

"Although you have been an inmate of my household for only a few months, all the members of the family eagerly watch for your coming, and every article is read aloud, and talked over and discussed, *pro* and *con*. To those who have a liking for science it is interesting and instructive. For those who have never discovered that they have a liking for such things, it opens a mine of interest and study and thought and rare enjoyment. We can't do without you."

A new subscriber writes as follows: "I have received the sample copy of your paper, and find it will in more ways than one repay me for the dollar which I send you for one year's subscription." Another says he is much pleased with the practical nature of the articles.

Such expressions, unsolicited, are naturally very gratifying, and we thank our correspondents for them.

METEOROLOGY FOR NOVEMBER, 1881.

The sum of my observations on the weather for the past month has been as follows: —

Average Thermometer.		Lowest.	Highest.	Range.
At 7 A. M.	35.97°	13°	54°	41°
At 2 P. M.	46.40°	25°	66°	41°
At 9 P. M.	39.97°	18°	58°	40°
Whole month	40.78°	13°	66°	53°
Last 18 Novembers	36.34°	31.12° in 1873.	42.53° in 1877.	11.41°
Autumn of 1881	53.57°	13°	90°	77°
Last 18 autumns	48.48°	42.84° in 1864.	53.57° in 1881.	10.73°

The average barometer for the past month was 30.057 inches, the lowest 29.45, and the highest 30.46, a range of 1.01 of an inch. The sum of daily variations was 8.49 inches, giving an average daily movement of .283 of an inch. The average for the last nine Novembers has been 29.970, the lowest 29.815, in 1873, and the highest 30.193 in 1880, a range of only .378 of an inch.

The face of the sky in 90 observations gave 48 fair, 10 cloudy, 18 overcast, 13 rainy, and 1 snowy. The amount of rain, including two inches of melted snow, was 4.05 inches; the average for the past thirteen Novembers being 4.13 inches, the lowest amount 1.62 in 1874, and the highest 7.45 in 1877, a range of 5.83 inches.

The direction of the wind gave an excess of only one northerly and forty-seven westerly observations over the southerly and easterly, indicating the prevailing direction very nearly west. The average direction for the past thirteen Novembers has been 19° 15′ north of west. It verged to the south of west only two years during the thirteen, namely, in 1878 and 1880, and then but slightly.

The month was unusually warm, being 4.44° above the average for the past eighteen years, and exceeded only in 1877, when it was 42.53°. And the entire autumn was the warmest, without exception, during the same period (53.57°). The next warmest autumns were in 1877, 1878, and 1879, each being over 51°. The first three days of the past month were peculiarly warm for November, having an average of near 55°, with a range of only 5° through the first two days at the three daily observations. This indicates great uniformity of temperature. The coldest days of the month were on the 28th, 25th, and 23d, with an average of 20.7°, 22°, and 24° respectively. The first flurry of snow was on the morning of the 15th. On the 23d about two inches fell, calling out a few sleighs.

I perceive, by a report in the Boston *Journal*, that the observations there differ somewhat from ours, the locality being less elevated and near the ocean. The time and frequency of their observations also differ, which must modify results. Their highest temperature was 71° on the 9th, and their lowest 15° on the 23d; while here the highest was 66° on the 3d (only 65° on the 9th), and the lowest 13° on the 23d. On the other hand, our rainfall was somewhat greater than in Boston, being 4.05 inches, and theirs only 3.73. This is probably contrary to the rule, as the fall is generally greater nearest the ocean, where also the barometer has a higher range, it being 30.624 inches at the highest in Boston, but only 30.46 in this locality.

D. W.

NATICK, *December* 8, 1881.

ATOMS.

THE Electro-Technical Society of Berlin (*Electrotechnischer-Verein*) offers a prize of a thousand marks (shillings) for the best essay on the transmission of power by electrical and mechanical means, which must be sent in before the 1st of October, 1882. — A gentleman was telling, at the recent meeting of the British Association, that he was eighty-one years of age, and had never been an abstainer, when he was greeted by the exclamation (which brought down the house), "You would have been a hundred by this time if you had." — The Medical Night-Service, which is organized in twenty arrondissements of Paris, during the year 1880 visited 1770 patients, of whom 651 were men, 883 women, and 236 children under three years. — Always stand a wet umbrella with the handle down; one trial will convince you of the rapidity with which it will drain, and your umbrella will last longer if dried quickly.

LITERARY NOTES.

Florida for Tourists, Invalids, and Settlers, by George M. Barbour (Appleton & Co., New York), contains a great deal of important and interesting information, presented in an agreeable style. The author went through Florida with General Grant, in the capacity of a newspaper correspondent, and after completing his trip was so well pleased with the country that he concluded to locate there. He travelled very generally over the State, and remained through the summer of 1880 in the southern section, in the woods. His descriptions of the country are graphic and probably truthful. He looks with a favorable eye upon everything, and has expectations of Florida's future that seem a little extravagant. He thinks it the place for the poor man to emigrate to, but we do not. The time may come when it will be better for the poor laborer to go South rather than West, but that time is not yet. We have spent two winters in Florida, and have seen something of its climate and industrial capabilities, and do not take so golden a view of the country as Mr. Barbour does. Still, the future of Florida is to be of no mean importance, and the State will be settled with great rapidity.

The Sun, by Prof. C. A. Young, of Princeton (D. Appleton & Co.), is an entertaining little book, by one of the most distinguished astronomers and mathematicians in the United States, and should be purchased by every intelligent parent for his own instruction and that of his family upon an interesting and important department of science. The subject of solar physics has been studied by Professor Young for many years as a specialty, and his researches are known the world over as among the most important contributions to science made during the present century. He has the happy faculty of presenting scientific facts in an attractive form, as our readers well know, from the contributions he has furnished to the JOURNAL. In the work under review, he has gone over the whole ground of the physical and chemical history of the sun, and every page is as exciting and absorbing as a novel. We predict for this work a wide sale, and that it will interest and instruct thousands we have no doubt.

We are indebted to W. A. Townsend, New York, for a copy of the *Physician's Hand-Book* for 1882, by Drs. Wm. and Albert D. Elmer. It contains, in addition to the usual blank Record of Practice for each month in the year, a classification of diseases with their symptoms; the treatment of emergencies; a list of poisons, their symptoms and treatment; diagnostic examination of urine; a list of remedial agents; and many valuable tables.

Upon his death, Professor J. Clerk-Maxwell left an unfinished manuscript entitled *An Elementary Treatise on Electricity*, which has been edited by Wm. Garnett, and published as one of the Clarendon Press Series. Most of it was written about seven years ago, and portions had been used by him as a text for his lectures at the Cavendish Laboratory. His aim was to present in as compact a form as possible those phenomena which appear to throw light on the theory of electricity, and to use them for the development of electrical ideas in the mind of the reader. In the first two chapters experiments are described which demonstrate the principal facts relating to electric charge considered as a quantity capable of being measured. The third chapter, "On Electric Work and Energy," consists of deductions from these facts. To make the book in a sense complete, the editor has reprinted a number of articles from Maxwell's larger work, *Electricity and Magnetism*. The book is in no sense a popular treatise, but a text-book for the close student, who would reduce the laws of electricity to a mathematical certainty.

Messrs. Gillet and Rolfe's *Elements of Natural Philosophy*, published by Potter, Ainsworth & Co., is an abridgment of the *Natural Philosophy*, by the same authors, with such changes as were required to adapt it to younger pupils. Like the larger book, which we have already noticed, it is fully up with the times in the practical applications of electricity and other natural forces, and will make an excellent text-book for high schools and academies.

The *Elementary Natural Philosophy* of Prof. La Roy F. Griffin, published by Sower, Potts & Co., Philadelphia, is also designed for high schools and academies. The apparatus used and the experiments performed are both described before introducing the laws which result from them. This teaches the student to observe and experiment for himself. Many of the illustrations are new and all are good.

The *Salt-Eating Habit* is the title of a pamphlet written by Richard T. Colburn, which attempts to prove that salt eating is unnecessary, and absolutely injurious.

The popularity of the *American Agriculturist* is seen in the fact that it is compelled to print two editions simultaneously, one in English, the other in German. Either edition may be ordered through us at clubbing rates. It is not merely a farm and garden journal, but is very useful to *every* housekeeper and to every household in village or country. It has an entertaining and useful department for the little ones, and is a journal that *pays to take and read*.

We welcome to our table *Food and Health*, edited by Mrs. Amelia C. Lewis, New York. It is published fortnightly, and is a most valuable contribution to the literature of food, its price, quality, adulterations, etc. Hygiene is also treated of in a popular but practical manner.

In 1879 sixty new medical journals were started, and twenty-three ceased to exist. Of the number started in 1880 we are not informed, but we find in Ayer's *American Newspaper Annual* a list of 112 medical journals in the United States, omitting those which do not insert advertisements. The most recent accession to this list is the *New England Medical Monthly*, edited by Wm. C. Wile, M. D., at Sandy Hook, Fairfield Co., Conn.

We have received from the Bureau of Education *Circular of Information*, No. 3, 1881, containing the proceedings of the department of superintendence of the National Educational Association at its meeting at New York, February 8–10, 1881; also Dr. Wickersham's able report on "Education and Crime," and Hiram Orcutt's article on "The Discipline of the School."

We are indebted to Dr. H. Carrington Bolton, of Trinity College, Hartford, for a copy of his pamphlet on the *Occurrence of Microscopic Crystals in the Vertebræ of the Toad*, illustrated.

The *American Newspaper Annual* contains a list of all newspapers and periodicals published in the United States and Canada. It is published by N. W. Ayer & Son, Philadelphia. The arrangement is geographical, and many useful statistics are also given. It will prove a valuable guide to those who advertise widely, as well as to all who have occasion to correspond with editors in distant places.

Medicine and Pharmacy.

WHY WE COUGH AND HOW WE COUGH.

EVERYBODY coughs sometimes, and, judging by the quantity of patent cough medicines sold, many people must be coughing all the time. Most persons suppose that a cough is a cough, the world over, and that what will cure one will another; and so they prescribe for themselves and their friends all sorts of syrups, home made or proprietary, with the consoling assertion that "it can't do any hurt, if it don't do any good." How do you know it can't do any hurt? Do you know its ingredients, and, if so, have you studied their effects upon the system in health and in disease? Do you know the condition of the patient you are prescribing this for, — his constitution, his habits of life, his past history?

Let us see what a cough is. It is a sudden and forcible expulsion of the air from the lungs, preceded by a temporary closure of the wind-pipe to give additional impulse to the current of air. The effect of these spasmodic expirations is the removal of whatever may have accumulated in the air-tubes, whether a foreign body from without, as when a particle of food finds its way into the wind-pipe, or an accumulation of mucus secreted by the air passages themselves.

Coughing is in part a voluntary act. We can cough whenever we wish to, but frequently we are compelled to cough when we don't wish to. Nerves are divided into two classes, sensory and motor nerves. The former carry intelligence to the brain; they report any disturbance on the frontier to headquarters. The motor nerves then carry back the commands of the general to act. You tickle a friend's ear with a straw, and his hand automatically proceeds to scratch the itching member. A tickling sensation is produced in the throat by any cause whatever; the brain then sends back orders to the muscles concerned to act so as to expel the intruder, in other words, to cough. And that is how we cough.

The source of the impression may be various. Frequently it is due to an irritation of the respiratory organs by foreign bodies, dust, and acrid vapors, admitted with the air in health, or to damp, cold air itself, if the organs are particularly sensitive, or to the presence of mucus, pus, or blood, in disease. Inflammation, from whatever cause, acts as a source of uneasiness.

There are, as we all know, many different kinds of cough. Thus, we have the *dry* cough, without expectoration, and the *moist* cough, with expectoration. We have the *short*, *hacking* cough, resulting from slight irritation, and the *violent*, *spasmodic*, and *convulsive* cough, caused by a greater degree of irritation or some peculiar modification thereof. Then there are the *occasional*, the *incessant*, and the *paroxysmal* cough, terms that explain themselves. *Hoarse*, *wheezing*, *barking*, and *shrill* coughs are due to the tension or capacity of the rim of the wind-pipe, or other portion of the tube. The *hollow* cough owes its peculiar sound to resonance in the enlarged tubes or the cavities in the lungs, if such exist. Sometimes the exciting cause of a cough lies not in the lungs and respiratory organs, but in the stomach, liver, or intestines. In other cases there seems to be no real cause; it is purely nervous or hysterical.

Cough remedies should be suited to the kind of cough in question, and attempt, if possible, to remove the cause. It is evident that a cough may be lessened either by removing the source of irritation, or by diminishing the excitability of the nervous mechanism through which it works. Both methods are generally employed, and most of the popular cough medicines consist of an expectorant and a sedative, in some mucilaginous or saccharine menstruum. Sedatives lessen the excitability of the nerve centre through which the act of coughing is produced. Opium in sufficient quantities will stop any cough, but if the secretion goes on accumulating, the patient must be allowed to cough, or he dies of suffocation.

Glutinous and saccharine substances lessen irritation, and as it frequently happens that much of the irritation which occasions the cough exists at the root of the tongue, and in portions of the throat which can be reached by troches and lozenges slowly dissolved in the mouth; hence these often afford relief, especially in dry, hacking coughs and the so-called tickling in the throat. Iceland moss, marshmallow, and gum arabic belong to this class. Their power is probably due to their covering the inflamed and irritable surface directly with a mucilaginous coat, and thus protecting it from the action of the air and other irritants. An inflamed surface, whether within or without, is rendered worse by friction; therefore, in bronchial troubles, the inflamed surfaces are greatly irritated by the very act of coughing. Hence, persons are advised to "hold in," or try to refrain from coughing. All coughing beyond what is absolutely necessary for the removal of the accumulated mucus should be avoided, because it injures the parts affected by friction, and because it exhausts the patient; for the muscular exertion involved in a violent fit of coughing is very considerable indeed, and the muscular effort exerted by a patient with a bad cough during the twenty-four hours is really more than equivalent to that of many a man in a day's work. Both sedatives and mucilaginous substances can be employed, then, to check the excessive amount of coughing over and above that required to relieve the lungs and bronchial tubes of their accumulated mucus. To facilitate the removal of this, expectorants of various kinds are administered, according to the necessities of the case.

The difficulty in the way of recommending any one kind of cough remedy is that different coughs require different treatment, and what will relieve one may aggravate another. Then, too, the general health of the patient must be attended to, the secretions kept open, etc. In short, the maxim, "What is one man's meat is another man's poison," applies here as elsewhere, and induces us to protest against the use of any nostrum simply because it cured a neighbor.

PHARMACEUTICAL LATIN.

WE have been interested in reading a paper on "The Pharmacopœial Nomenclature," read at the last annual meeting of the American Pharmaceutical Association, by Oscar Oldberg, Ph. D., and recently published in the Proceedings of the society. It is a careful study of the subject, and includes many good practical suggestions, with some not so good.

The author begins by defending the use of Latin for the nomenclature, which, in order to be "correct, exact, and significative," he tells us, must be constructed from a dead language, and not a living one, the latter being subject to change, while the former is "unchangeable." "We can arbitrarily and permanently give to any Latin word a specific meaning, which that word will not fail to convey at any time, because a word from a dead language is above the ideas that *change*, as of necessity do all names and ideas of a living language." We do not see that this is necessarily true of scientific or technical terms, which are as permanent and unchangeable in English as in Latin. Their meaning, once fixed by the general consent of scientists, remains the same so long as the theories on which they are based continue to be accepted. When these change, the terms may have to be changed to conform to the new hypotheses. Besides, the Latin names are simply translations of the English ones. As our author says, referring to the "Berzelian" system of chemical nomenclature, "all that is necessary is to *literally translate* these names into *the corresponding Latin ones*." Thus *ferrous chloride* becomes *ferrosum chloridum*, *cupric oxide* becomes *cupricum oxidum*, etc.; but surely, until we have another "new chemistry," *ferrous chloride* and *cupric oxide* are as definite and invariable in meaning as *ferrosum chloridum* and *cupricum oxidum*.

A better reason for the use of Latin is that it is the language used in other pharmacopœias, and enables us to understand them; and if we ever have an "international" nomenclature, it will certainly be a Latin one.

Dr. Oldberg's notions as to what is to be desired in a Latin nomenclature are in the main to be commended. Among the principles he lays down are these: "No name used should be one that does violence to established knowledge or perpetuates ignorance" (like grouping "volatile oils," so called, with the "fixed oils"); "each name should be clear and descriptive, as far as consistent with necessary brevity" (for instance, the particular *part* of a plant used in pharmacy should be specified, as *sennæ folia* rather than the vague *senna*); "no official [Dr. Oldberg uses the English "official" throughout, in preference to the Yankee "officinal"] name is proper which is capable of essentially different interpretations, or which has been, or is, applied to more than one thing" (like *ferri phosphas*, which means a phosphate of iron, but does not tell us which one); "harmony with the rest of the civilized world is desirable so far as attainable without sacrifice of clearness and correctness, and without too violent changes" (thus *stibium*, *kalium*, and *natrium*, which are used everywhere except in England and the United States, and from which our chemical symbols Sb, K, and Na are taken, are to be preferred to *antimonium*, *potassium*, and *sodium*), and so on.

Among the changes in the received nomenclature which Dr. Oldberg proposes, the most radical, and the one most likely to provoke opposition, is the substitution of the nominative for the genitive everywhere. Thus, tincture of rhubarb will be *rheum tinctura* instead of *rhei tinctura*, soap plaster will be *sapo emplastrum* instead of *saponis emplastrum*, etc. There is little to be said in favor of this, except that it is a gain in simplicity, at the expense of syntax, and that it relieves physicians and pharmacists of the necessity

of knowing the genitive of the Latin nouns they use. But all the grammar needed for this pharmaceutical Latin could be put into a page or two and learned in a few hours; and for the benefit of those who do not want to master even this "small Latin," the genitive might be appended to the nominative in all reference lists of the names.

It seems inconsistent to retain the Latin plurals, *semina*, *folia*, *flores*, etc., when the genitives are discarded. It may be said that the singular is not used, and that if only one form is learned it may as well be the plural. We see, however, that Dr. Oldberg retains the distinction of gender in *aromaticus*, *aromatica*, *aromaticum*, etc.; but why should the pharmacist be expected to decline adjectives when he is relieved from the necessity of declining nouns, and why should he be required to learn that *pulvis* is masculine, *aqua* feminine, *extractum* neuter, and the like?

In his "Unofficial Pharmacopœia" (an excellent compilation of some seven hundred popular preparations, with much other matter of practical value to the pharmacist) Dr. Oldberg gives the Latin names according to his ungrammatical system. We note, however, an occasional violation of his own rule, as in *vinum extractum carnis*, etc. Why the genitive *carnis*, when elsewhere we have *extractum opium*, not *opii*?

On the whole, if Latin is to be retained for the pharmacopœial nomenclature, it had better be grammatical Latin. Those who know the language should not be compelled to use a barbarous burlesque of its forms, in order to spare others the small effort necessary for mastering a few inflections and constructions. Let the changes in the nomenclature be such as Dr. Oldberg has suggested in the principles quoted above, — in clearness, accuracy, precision, and conformity to modern science, — changes which are obviously for the better; but let "dog Latin" be left to those who have never learned, or, haply, have forgotten, the grammatical kind. The best of this prescription Latin is bad enough to a classical scholar, and to make it worse, deliberately and systematically, would be intolerable.

NITRE-TABLETS FOR ASTHMA AND INSOMNIA.

Dr. William Murrell, in the *British Medical Journal*, writes: There can be no question as to the value of fuming inhalations in the treatment of asthma. The ordinary nitre-paper often fails, because it is not strong enough. For some time I have been in the habit of using very thick and strong nitre-papers, which may be called "nitre-tablets." They contain both chlorate and nitrate of potash. Each consists of six pieces of white blotting-paper, about six inches square, and they are made by dipping them into a hot saturated solution of nitre and chlorate of potash. Before the pieces are quite dry they may be sprinkled with Friar's balsam, spirit of camphor, tincture of sumbul, or some aromatic. The nitre-paper so prepared is as thick as cardboard, each piece consisting of six pieces of blotting-paper, closely adherent, and covered all over with crystals of saltpetre and chlorate of potash. The door and windows having been closed, the tablet is placed on a fire-shovel or piece of metal of some kind, and folded down the middle, so as to make it like a tent or the cover of a book. When lighted at each end it burns very quickly, throwing out a flame often four or five inches long, and giving rise to dense volumes of smoke. The asthmatic patient almost immediately obtains relief, and drops off into a quiet slumber, from which he awakes refreshed. These tablets often succeed when the ordinary nitre-papers do no good. They nearly always induce sleep, and I have used them with success in cases of insomnia when most of the ordinary remedies have failed. Large pastils composed of equal parts of nitre and lycopodium are also useful in asthma.

NOTES FROM ABROAD.

Opium-Eating in China Defended. — The London *St. James Gazette* comes to the defence of Chinese opium-eating. Malarious fever, it says, is one of the scourges of the population, and opium is known to have been one of the earliest remedies for ague before the discovery of the Jesuits' bark and of quinine. Even now the Fen populations of England are said to have the habit of indulgence in laudanum in preference to alcohol. Therefore, that a vast quantity of opium should be smoked in China is natural and inevitable, and to limit the supply would be *primâ facie* the most gratuitous cruelty. There is, moreover, another reason why sedatives should be largely resorted to by the Chinese. The agitators for total abstinence are finding out to their dismay that their recommendation of tea and coffee in substitution for alcohol is leading to physical evils produced by nervous stimulants in excess, which are even worse in their way than those resulting from drunkenness. There is strong reason for believing that a largely tea-drinking population cannot safely dispense with either alcohol or opium. There has never been any such controversy among medical men respecting the absolute usefulness of opium as has arisen on the subject of alcohol. In some quantity or other, the products of the poppy are invaluable; and nearly the latest and perhaps the greatest of medical discoveries consists in the injection of one of them into the blood. The fact is by itself enough to necessitate a revision of the whole argument about the opium traffic.

Mechanico-Therapeutics in Stockholm. — A short description of Dr. Zander's Mechanico-Therapeutical Institute in Stockholm is given by Dr. Gilbert Smith in a recent number of the *Lancet*. It is practically an institution where all kinds of active and passive muscular movements are produced by machinery. There are in all sixty-seven machines in the establishment, seventeen for active arm movements, eighteen for active leg movements, nine for active trunk movements, and twenty-three for passive movements. No springs are used, but all is done by levers. In this way the resistance brought to bear is like the muscular contraction, greatest at the middle and least at the two ends. Many novel movements and muscular exercises are produced. Thus there is a machine for shaking the whole or part of the body. This is found to be excellent in heart and lung diseases, promoting expectoration and improving the circulation. There are foot rubbers, chest expanders, machines for hammering the muscles, for exercising the trunk muscles, for rolling the feet, etc. In all cases the amount of exercise can be exactly regulated, and on this account in part the effects are better than those obtained by simple massage.

What Coffee Will Do. — According to Dr. Bock, of Leipsic, coffee and tea are the chief causes of the nervousness and peevishness of our time.

Dr. Henry Segur takes the opposite ground, and enumerates the blessings which the infusion can produce.

It is a mental and bodily stimulant, assisting to convert the blood into nervous tissue, and thus recruit the nervous moving and thinking faculties.

It lessens the waste of tissue, and thus lessens the amount of food necessary to support the system.

It will often cut short and cure attacks of intermittent fever.

In typhus fever it increases the excretion of urea, and so far purifies the blood without increasing tissue metamorphosis.

It tends to lessen coma and low delirium. It is Dr. Segur's chief reliance in yellow fever.

It is useful in spasmodic asthma, whooping-cough, and hysterics. It is a diuretic in cardiac dropsy. In opium-poisoning its efficacy is well known.

After a heavy meal it relieves the sense of oppression and helps digestion.

It is a disinfectant and deodorizer.

Habitual coffee-drinkers generally enjoy good health, and live to a good old age.

Hydrophobia in Paris. — In consequence of the frequency of cases of hydrophobia, the Préfet de Police has ordered the following "instructions," prepared by the Conseil d'Hygiène, to be placarded: "When a person has been bitten by an animal, either mad or supposed to be so, the wound should be induced to bleed, and should be washed and cauterized. (1.) By a sufficient amount of pressure the bites, whether deep-seated or superficial, should be caused to bleed as abundantly as possible, and then washed in water, with a jet, if possible, or in any other liquid (even urine), until caustics can be applied. (2.) Cauterization may be made by Vienna paste, butter of antimony, chloride of zinc, and by red-hot iron, which seems to be the best of all. Any piece of iron (the end of a rod, a nail, a key, etc.) may be used for the cauterization, which should penetrate to every part of the wound. (3.) The success of the cauterization depending upon the promptitude with which it is executed, any one is able to practice it at once before the arrival of a doctor. (4.) Cauterizations made with ammonia or different forms of alcohol are quite inefficacious."

Treatment of Small-Pox. — "On the 16th of January, 1880," says Dr. Bouyer, of St. Pierre de Fursac, in the *Journal de Thérapeutique*, "I addressed to the Academy of Medicine the following letter: 'I have the honor to forward to the Academy a sealed packet containing a formula for what I believe to be the curative and abortive treatment of small-pox, and which I have found very successful in six cases. When I have tried the treatment in a greater number of cases, I shall lay before the Academy the results of my investigation.'" On the 16th of March Dr. Bouyer had treated fifteen cases, all confirming the efficacy of the remedy, and shortly afterwards he was pleased to make it known. The following is the formula recommended: —

Alcohol	10-15 grams (2½–4 ℥).
Salicylic acid	1 gram (16 grs.).
Simple syrup	20 grams (5 ℥).
Water	50 grams (2 ℥).

Of this a tablespoonful should be taken every six hours if the case is seen early, and every four hours if the disease is well advanced before the treatment is begun. Dr. Bouyer finds that under this treatment, commenced early, the eruption is discrete, or, if confluent, the pustules are of small size, and contain little pus. They contract between the sixth and eighth day, leaving light furfuraceous crusts, which fall off in a few days without leaving either cicatrices or stigmata. The fever of suppuration is always greatly diminished.

Medicine as a Science. — Sir James Paget, in his eloquent address before the International Medical Conference, refers thus to the preëminence of the medical profession in its range of opportunities for scientific study: "It is not only that the pure science of human life may match with the largest of the natural sciences in the complexity of its subject matter; not only that the living human body is, in both its material and its indwelling forces, the most complex thing yet known, but that, in our practical duties, this most complex thing is presented

to us in an almost infinite multiformity. For in practice we are occupied, not with a type and pattern of the human nature, but with all its varieties in all classes of men, of every age and every occupation, in all climates and all social states; we have to study men singly and in multitudes, in poverty and in wealth, in wise and unwise living, in health and all the varieties of disease; and we have to learn, or at least to try to learn, the results of all these conditions of life, while, in successive generations and in the mingling of families, they are heaped together, confused, and always changing. In every one of all these conditions, man, in mind and body, must be studied by us; and every one of them offers some different problems for inquiry and solution. Wherever our duty or our scientific curiosity — or, in happy combination, both — may lead us, there are the materials and there the opportunities for separate original research."

A Resurrection. — Bucharest papers relate the following incident: A young woman died of smallpox, and, pursuant to police regulations in times of epidemics, the body was interred without loss of time. The girl had been engaged to be married, and, accordingly, her relatives had adorned the body of the deceased with the jewels that had been presented to her. These trinkets aroused the cupidity of three individuals, who resolved to desecrate the tomb. The grave was opened, the body taken out, and the jewels removed. During these procedures one of the robbers was, by his companions, accused of cowardice, and to disprove the assertion he launched a terrible blow at the dead girl. The effect was magical: the supposed corpse assumed the sitting posture, and begged for mercy; the robbers, however, fled terror-stricken in hot haste. The girl arose, and with trembling steps sought the dwelling-place of the curate, who, after a preliminary scare, finally comprehended the situation, and volunteered to prepare her relations for the news. Joy reigned supreme. In consideration of the service they had rendered the robbers were not prosecuted.

THERAPEUTICAL HINTS.

The Fluorides in Medicine. — Dr. J. M. Da Costa, according to the *Archives of Medicine*, has been making some experiments with the salts of fluorine. Fluoride of potassium, of sodium, and ferrous fluoride were the preparations chiefly tested. The fluoride of potassium was best borne and most used. This was given in doses of two or three grains. It was first given in a case of subacute rheumatism with considerable pain. The pain was materially relieved without producing drowsiness. Gastric disturbance soon set in, however, and the drug had to be stopped. In other cases of rheumatism like effects were produced.

Application to Burns. — According to Paul, saccharate of lime may be used in a combination as follows: equal parts of sugar and hydrate of calcium are rubbed up, gradually adding water until it has the consistence of thin paste. After standing two days it is filtered and evaporated to a thick syrup, to which is added one part of glycerine and three parts of oil.

Treatment of Hydrofluoric Acid Wounds. — In cases of injury arising from the effects of hydrofluoric acid on the skin, A. E. Robinson recommends treatment with a paste of chalk and water, *and afterwards with a mixture of chalk and olive oil.* This latter mixture allays the pain and suffering considerably, and materially hastens the healing process, as he had occasion to witness a few days ago in reference to an assistant in his employ. He was treated thus, and now the face-wounds (which were very severe and deep) are healing over, forming a perfectly healthy skin.

Lemon Juice in Diphtheria. — Dr. J. R. Page, of Baltimore, in the New York *Medical Record*, invites the attention of the profession to the topical use of fresh lemon juice as a most efficient means for the removal of membrane from the throat, tonsils, etc., in diphtheria. In his hands (and he has heard several of his professional brethren say the same) it has proved by far the best agent he has yet tried for the purpose. He applies the juice of the lemon, by means of a camel's-hair probang, to the affected parts every two or three hours, and in eighteen cases on which he has used it the effect has been all he could wish.

SELECT FORMULÆ.

Cough Medicines. — The winter coughs so prevalent at this season require attention, and much money is wasted on the various nostrums so extensively advertised; some of them are harmless, others inert, and a few dangerous, while all are sold at an exorbitant profit. In most cases the advice of an experienced physician should be obtained, because at different stages of the cough different treatment is required. We present a few simple recipes for expectorants, used by regular physicians. The first is particularly useful for young children: —

Syrup of squill	℥i.
Gum acacia, powdered	ʒss.
Ammonium chloride	gr. viii.
Peppermint water	q. s. ad ℥ii.

Dose for a child, a teaspoonful every two hours.

Another formula for adults and older children consists of

Syrup of ipecac	2 parts.
Syrup of squill	4 "
Paregoric	1 part.

Dose, half to one teaspoonful, repeated as often as necessary.

The following was a favorite prescription of the late Prof. C. A. Lee: —

Syrup of ipecac	℥i.
Syrup of tolu	℥i.
Paregoric	ʒss.
Syrup wild cherry	ʒi.

For Hoarseness. — Dr. Eichelberger gives the following, which he says is very good for hoarseness: —

Tinct. chloride of iron	ʒij.
Glycerine	℥ss.
Water	ʒss.

Dose, half a teaspoonful *pro re nata.*

A Cure for Hiccough. — *Le Scalpel* gives a very easy cure for a continued singultus, sometimes complicated with spasm of the glottis, introduced by Rostau and highly recommended by Deghillaye, of Mons. It consists in placing the hand flat upon the epigastrium, immediately below the ensiform cartilage, and making firm pressure. Should this prove unsuccessful, place a firm roll of muslin on the same place, securing it by a napkin bound tightly around. In an hour this may be removed, and it will be found that the hiccough has entirely disappeared.

Chilblains. — The following formula for the relief of itching and irritation is recommended by Dr. Hildreth in the *Medical Brief:* —

Sulphurous acid	1 ounce.
Glycerine	1 "
Distilled water	2 ounces.

Apply night and morning.

Another formula is given by Kilner: —

White wax	2 drachms.
Spermaceti	2 "
Balsam, Peru	1 drachm.
Olive oil	3 ounces.
Muriatic acid	2 drachms.
Water	6 "

Make a plaster, and apply.

Toothache Remedy. — The following is commended: —

Tinct. iodine	gt. x.
Carbolic acid (dil.)	ʒss.
Chloroform	ʒss.

Mix, and apply to the gums.

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Horsford's Acid Phosphate in Depression from Overwork. — I find Horsford's Acid Phosphate beneficial in nervous depression and anxiety resulting from overwork.

W. R. Page, M. D.

Sandusky, O.

Wilkins Micawber longed for something to turn up, as rapid writers longed for a steel pen to write like a quill. With this purpose, Esterbrook & Co., years ago, concluded to turn up the points of three of their pens, the Tecumseh, Choctaw, and Telegraphic.

Cephaline can be used with the certainty of beneficial results.

GOOD WORDS FROM SUBSCRIBERS.

Port Richmond, *December* 3, 1881.

The pleasure and profit received for many years by the subscriber from the pages of the Journal have always been much more than the subscription price paid for. Yours,

A. De Groot.

Dore, Michigan, *December* 2, 1881.

Being an old subscriber, and appreciating the benefits already received from your Journal, I hasten to renew my subscription to the same, as *each copy* is worth the *dollar* to me.

John A. Beamer.

Sheldon, Ill., *December* 3, 1881.

Please receive my thanks for the very useful information contained in the Journal, of which I am a *life member.*

Yours very respectfully, John H. Ekstrand.

Buffalo, N. Y., *December* 3, 1881.

I get more solid satisfaction, and my Index Rerum more reference, from the Journal of Chemistry than from any other journal to which I am a subscriber. Truly yours,

W. C. Barrett, M. D., D. D. S.

Wausau, Wis., *October* 29, 1881.

I am making up my list of periodicals for next year. Please send your lowest clubbing list. I shall take the Journal another year, as it has become a necessity, not only in my school work, but also in my family. You are doing us good. Truly yours,

C. D. Abbey.

Brookeville, Md., *August* 15, 1881.

Esteemed Friend, — My expenses seem so great and farming so unprofitable that I thought I should have to discontinue some of the many papers I have been taking, and among them your valuable monthly; but I find that I must save in some other quarter, and continue the Journal of Chemistry, which is too useful to be dispensed with. Your friend,

James S. Hallowell.

New York, *November* 12, 1881

I can only say "good words" for the Journal. Mine is being read by the teachers in our public schools, and I may send in one or two subscriptions. The article in the October number on "Strange Showers" was listened to with great interest by the scholars. Wishing you long life and prosperity, I remain with respect, yours,

F. D. B.

Boston Journal of Chemistry
AND
POPULAR SCIENCE REVIEW.

VOLUME XVI. BOSTON, FEBRUARY, 1882. NUMBER 2.

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Familiar Science.

IT is indeed wonderful that chemists are able to change common sawdust into new and unlike substances, as sugar, oxalic acid, and powerful explosive agents. The waste product which artisans are glad to be rid of without charge can be so transformed in the laboratory as to serve the purposes of sugar in a cup of coffee at the breakfast table, or as a sharp and poisonous acid, useful in removing tarnish from the brass andirons in the fireplace, or as a substance which is capable of rending rocks with terrific force. It is only when such positive and practical results are accomplished by chemists that the popular mind is awakened to a full realization of the mighty work done by toilers in the laboratory.

EVERY one brought in contact with milk has observed that it acquires a *blue* appearance upon standing a few days. This is due to an organism which is allied to bacteria, and can be transplanted into other samples of milk and various solutions. It is evident that milk is a secretion which is subject to speedy changes from atmospheric influences; it should therefore not be allowed to remain long in open vessels before it is used for food purposes.

INVENTORS and experimenters in the department of electric lighting are very certain that electricity is speedily to extinguish gas-lights, and enthrone itself in houses, workshops, factories, etc., as king in the field of artificial illumination. No one can doubt as regards the great improvements recently made in the appliances and devices for electric lighting, but much yet remains to be accomplished before our gas-lights follow tallow candles to the shades of darkness.

THE danger from the use of vessels of tinned iron in cooking, and for holding water used for culinary purposes is so great that in France recent legislative enactments regulate the manufacture of tin, requiring an increase of the thickness of the coating of tin, and prohibiting, under severe penalties, any admixture of lead or other metals. But few are aware of the frauds practiced in the manufacture of tinned iron, or know of the dangers which attend the use of the cheaper varieties of the ware. The cans used for preserving fruits, meats, soups, etc., are made from the cheapest tin, and the coating often holds ten, or even fifteen, per cent. of lead or zinc. The use of canned foods is increasing constantly in families, and unquestionably many of the mysterious illnesses which the physician is called to treat result from lead or zinc poison. The attention of Congress should be called to this matter, and laws enacted, like those of France, prohibiting the importation or manufacture of tinned iron containing any poisonous metals.

THE desirability of a reliable and safe antiseptic agent has led chemists to experiment extensively, with the view of discovering some body that might meet the want. Salicylic acid has been largely used, but it has been found not to be efficient or safe enough for general employment, and recently attention has been called to *cinnamic* acid, a derivative of the benzol series. It is a substance which crystallizes in brilliant plates, is free from taste, not poisonous, does not irritate when applied to skin abrasions or wounds, and is not absorbed. It is moderately soluble in water, oil, spermaceti, glycerine, etc. As it is a by-product in the manufacture of benzoldehyde, benzoic acid, and benzoic ethers, the price is very moderate, which is an important consideration. What we need is an agent which will prevent fermentative action in syrups, solutions, infusions, etc., and which will prevent rancidity in fatty bodies of all kinds; also, if meats can be kept sweet in the open air, and fruits preserved a most desirable end will be reached.

THE manufacture of glucose has become an industry of so much importance that new and cheaper sources for a supply of starch are anxiously sought for. Hitherto, Western corn has afforded this substance at lower rates than any other product, but attention is now turned to the cheap Florida arrow-root, or cassava, the source of tapioca. It has been stated that a pound of corn gives a pound of glucose, but this refers to the syrup, which manufacturers call glucose, and which contains much water. The solid grape sugar cannot be produced, probably, in larger quantity than one pound from a pound and a half of corn. If 30 bushels of corn are grown upon an acre, we have about 1000 pounds of solid glucose to the acre, which, at 4 cents a pound, gives 40 dollars profit, as the by-products will probably pay for manufacturing. If one hundred bushels can be raised upon an acre, the profit is swelled to 100 dollars. Cassava, it is alleged, is capable of affording starch enough in the product of an acre to make 20,000 pounds of glucose. If this is true, the Western glucose manufacturers will look to Florida and other Southern States for the starch for their factories.

CONCERNING VANADIUM.

IN 1801, a chemist named Del Rio discovered a new metal in a Mexican lead ore, and gave it the name of *erythronium* (from a Greek word meaning *red*), because its salts became red when heated with acids; but later he became convinced that Collet-Descotils was right in conjecturing that the supposed new element was nothing but an impure oxide of chromium. In 1830, Sefström found a new metal in certain Swedish iron ores, and called it *vanadium*, from *Vanadis*, one of the names of the Scandinavian goddess Freia. In the same year Wöhler showed that the ore on which Del Rio had experimented was a vanadate of lead. Sefström, being unable to continue his investigations, handed over the small quantity of the new metal he had obtained to Berzelius, who, in 1831, published the results of an exhaustive study of vanadium and its compounds. He classed it with chromium and molybdenum, and his views were accepted by chemists generally until 1867, when Roscoe showed that what Berzelius had taken to be metallic vanadium was either an oxide or a nitride, according to the method of preparing it; and that the element, instead of being analogous to chromium, really belonged to the antimony group.

Pure vanadium is so difficult to obtain that it is one of the rarest of chemical curiosities. It is a grayish-white powder, which under the microscope shows a silvery metallic lustre. No use has been found for it in the arts, but some of its compounds have come to have considerable industrial importance, and the increasing demand for them has led to a search for new sources whence they may be obtained. They are chiefly used in the production of aniline blacks and other dyeing and printing materials. It has recently been found that they can be prepared from the slags which accumulate in such quantities at all large iron-works. In 1867, a few calico printers in the neighborhood of Rouen began to try vanadium in very small quantities as a substitute for the sulphide of copper. At that time the vanadium compounds were very rare, and vanadates with fifty per cent. of the metal were sold at nearly the price of gold. Nevertheless the new agent, on account of its wonderful efficacy, proved decidedly economical in comparison with sulphide of copper, and was found to have other advantages in practice. The metavanadate of ammonia was commonly used, which was obtaine

at first from certain German works, and afterwards from Sweden. Within the past year great quantities of vanadium have been found in France in the silicates of the alkaline earths remaining from the manufacture of steel by the Thomas and Gilchrist process. The phosphoretted cast-iron contains vanadium, which is oxidized on blowing in air, and remains in the slag. The slags contain, on an average, one per cent. of metallic vanadium, and from selected slags two per cent. may be obtained.

On treating the slags with muriatic acid, a solution of a vanadium salt is obtained which, in spite of the presence of other articles, may be used at once for printing. With 200 parts of muriatic acid the salt in 100 parts of ground and sifted slags may be perfectly extracted. The powder is stirred up in twice its weight of water, and the acid is added gradually, stirring constantly; a little sulphuretted hydrogen escapes, and the silica separates out as soon as the temperature of 158° F. is reached. Then 600 parts of water are added. The solution, after standing a while, is filtered, and deposits a little more silica. The extract of two ounces of ground slag is said to be sufficient for more than 200 gallons of dye.

The growing importance of these vanadium salts in the arts is a curious and striking illustration of the unexpected practical value of a discovery which seemed at first to be of interest only to theoretical chemists. It is not every investigation that bears such fruits, but the result is none the less an encouragement to the patient student of nature's secrets.

EXPERIMENTS FOR YOUNG CHEMISTS.

BY PROF. E. J. HALLOCK, PH. D.

V.

AMMONIA.

Ammonia gas, NH_3, is usually made from ammonium chloride, NH_4Cl, and slaked lime, also called calcic hydrate, $Ca(HO)_2$. The reaction is represented by the equation —

$$2NH_4Cl + Ca(HO)_2 = 2NH_3 + CaCl_2 + 2H_2O.$$

A wide-mouthed bottle, which must be perfectly dry, is supported in an inverted position, and the delivery tube introduced into it, as shown in Figure 7.

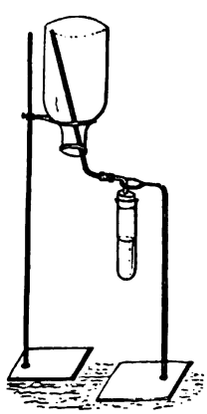

Fig. 7. Preparation of Ammonia.

Place a piece of good fresh lime, such as is used for whitewashing and for making mortar, in a saucer, and pour a little water on it. In a short time it will become quite hot, showing that chemical action is taking place. This is called slaking; the lime, CaO, combines with the water to form the hydrate: $CaO + H_2O = Ca(HO)_2$. Weigh out 5 grams of pulverized ammonium chloride, and mix with it 8 grams of the dry slaked lime, and introduce the mixture as quickly as possible into a test tube. Add a few drops of water, and insert the cork and delivery tube as shown in the figure. During this operation the peculiar pungent odor of ammonia will be perceived.

When all is in readiness, apply a very gentle heat, taking care that the mixture does not foam up high enough to reach the delivery tube and choke it. In a short time the bottle will be full of ammonia gas, and when a piece of reddened litmus paper is moistened and brought near the mouth of the bottle it will turn blue. A glass rod dipped in hydrochloric acid and brought near the mouth of the bottle will give off dense white fumes of ammonium chloride: $NH_3 + HCl = NH_4Cl$. These are two of the best tests for free ammonia, and together with the familiar odor are sufficient to recognize it by. To test for ammonia when combined, as in the ammonium salts, it is necessary to mix them with slaked lime or any caustic alkali, when the above tests can be applied to the gas which is set free. If a lighted taper be introduced into the bottle of ammonia gas it will be extinguished, as in the case of nitrogen, but its odor prevents our mistaking it for that gas. After performing these experiments, replace the inverted bottle by another clean and dry bottle. When the second bottle gets full of gas, as shown by the action on litmus paper, remove it quickly and invert it over water. In a short time the water will begin to rise in the bottle, which will soon be nearly filled with it. Ammonia gas is very soluble in cold water, and as it dissolves a vacuum is left, and the water is forced up into it by the atmospheric pressure from without.

To find the specific gravity of ammonia, we proceed as in the case of nitrous oxide: —

1 Nitrogen	14
3 Hydrogen	3
Molecular weight	17
Specific gravity	8½

Gases which are soluble in water are collected in dry vessels by *displacement*. If the gas is lighter than atmospheric air, they must be collected by *upward* displacement, as was done in this case.

A strong solution of ammonia gas in water is called ammonium hydrate by the chemists, but aqua ammoniæ by the druggists. Ammonia gas can be obtained very conveniently by boiling this solution.

To ascertain the composition of ammonia we resort, as in the case of water, to *electrolysis*. The apparatus employed is seen in Figure 8, and consists of two glass tubes, closed at one end, and inverted in a funnel that has been plugged and provided with platinum electrodes. Fill the funnel about half full of dilute ammonia solution. Fill each tube with the same, and invert them in such a manner that one tube shall be over each electrode. On passing the current of a galvanic battery through the solution, bubbles of gas will be given off and will collect in the tubes. It will be observed that the gas collects faster in one tube than in the other, and the gas of which there is a greater quantity will be found, when tested, to be pure hydrogen; the other gas is nitrogen. When the experiment is very carefully performed, the quantity of hydrogen is found to be three times as great as that of nitrogen; hence

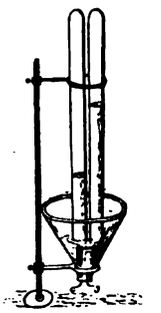

Fig. 8. Electrolysis of Ammonia.

the formula is NH_3. Owing to the unequal solubility of the two gases, these proportions are not always observed.

Caution. Do not attempt to repeat this experiment by using a solution of ammonium chloride in place of the ammonium hydrate, or aqua ammoniæ, as a very dangerous explosive compound of nitrogen and chlorine will be formed.

WASHING WOOLLEN FABRICS.

The traditions and the practice of housekeepers vary much in regard to the washing of woollen goods; and a writer in the *Journal of Commerce* has done good service in making practical tests of the most approved methods. He reports the results as follows: —

I tried many degrees of temperature, from very hot to cold. I also used all the ingredients which are generally recommended for this purpose, — soap, borax, ammonia, benzine, and mixtures of them. The results were very different from each other, and I can therefore call the following methods thoroughly reliable, as they are based on practical experience.

(1.) The liquid to be used for the washing must be as hot as possible.

(2.) For the cleaning out of fatty matter (sweat, etc.), borax is of so little use that it is only a waste. Soap solution by itself is better, but the best is soap solution with an addition of ammonia. The latter works wonderfully by quickly dissolving the dirt in clothes which generally are very hard to clean (that is, underclothing, etc.), and also brightens up colors, and is therefore a very excellent detergent.

(3.) For the cleaning of white woollen goods, however, borax leaves all other cleaning substances behind. A soap solution with an addition of borax, if used boiling hot, leaves the goods as bright, in fact often brighter, than when they were new.

(4.) If shrinking is to be entirely avoided, or even if the goods are to be made looser and wider, it will be necessary to prepare for a very quick drying by wringing them or pressing them between two pieces of cloth. In no case should the goods be dried in the sun, as in such case they shrink and get hard. It is best to dry them in a good air draught, or, in winter, in a warm room, but not *too* near the fire.

For good woollen goods, white and colored pieces are treated differently. For colored ones a solution is prepared of two ounces of good oleine soap in two gallons of water; this proportion may be altered according to the state of the goods. This solution is divided into halves, and to one of these halves two teaspoonfuls of ammonia are added. When the goods are put into the solution, it must be so hot that it cannot be touched by the hand; it is therefore necessary to work them about with a wooden stick. They are then pressed well, and brought

into the second part of the original solution, which contains no ammonia. This has now generally cooled down so far that the goods can be worked round by hand; wringing should in every case be avoided. The goods are next passed between several dry cloths, until they do not receive any moisture, and are then put into the shape which they had originally; underclothes are drawn a little more into the width. In hanging them on the lines for drying, it must be observed that they are placed in such a way that the neck part hangs on one side and the lower part on the other.

In washing white goods, instead of ammonia, two teaspoonfuls of borax are added to the soap solution, and worked in the same manner as above. If the second solution should be too soapy, it must be diluted with a little water. It is very important that the washing liquor should, after every washing, be brought up to the original temperature. The liquor can be used again afterwards by allowing the dirt to settle, and then drawing the liquor off.

ELECTRIC SPARKS.

Electric Light in Photography. — The method of photographing with the electric light, adopted, with marked success, by M. Liebert in the Rue de Londres, Paris, is described in a recent number of *La Nature*. A hollow hemisphere about two meters in diameter is suspended adjustably from the roof, so as to present its concave side towards the person to be photographed. In this cavity are two carbons, one fixed, the other movable by means of a screw. The latter can be brought towards the former at a right angle. There is no other mechanism; the time of exposure is so short that the light does not fail in it. The novelty of the system consists in not throwing the light directly on the person; the beams in that direction are thrown back from a small reflecting screen to the concave surface of the hemisphere, which is painted white. The individual is thus flooded with well-dispersed light, which the eyes bear without fatigue.

Draining Mexican Marshes by Electricity. — The most extensive application of electricity to engineering ever attempted will, by the plan of Mr. Maxim, of New York, be employed for draining the basin around the city of Mexico, to do which a company has been formed, the funds raised, and the contracts signed. The plan in brief is to establish on the western slope of the mountains, where the fall is great and rapid, a number of water-wheels sufficient to develop some 20,000 horse-power, and make them drive dynamo-electric machines of high electro-motive power. The current from these machines is to be conducted about twenty miles to a set of electric motors placed on the margin of the lake, and used to drive pumps, which will require about 7000 horse-power to work them. The water has to be raised about forty feet to clear the ridge, but once raised it has uninterrupted fall toward the Pacific of several thousand feet, so that the descending water is made to keep up the work. The whole apparatus constitutes what Mr. Maxim calls an "electric siphon." The plan will, it is believed, succeed, and thus relieve Mexico of the inundations that have submerged it so much for so many centuries.

Cheap Carbons for Batteries. — A method of preparing cheap carbons for voltaic batteries has been devised by M. Mauri. It consists in taking finely powdered graphite mixed with an equal weight of sulphur free from carbonate, and heating the mixture in a crucible until all the sulphur is fused. The temperature, however, should not be raised above 200° C. When the mass is fluid it is poured into a suitable mould of metal, and a stout copper wire is inserted to serve for an electrode. When the mass is cool and solid it is ready for use. Its conductivity is practically as good as that of the best retort carbon, and as it is more electro-negative than simple carbon, the electro-motive force of the cell is higher. By increasing the proportion of sulphur in the mixture, a highly resisting composition may be obtained, which can take the place of copper or platinum silver coils for telegraphic or electric lighting purposes.

An Iodine Battery. — Mr. A. P. Laurie has constructed an iodine battery, whose great merit is that it combines the simplicity of a single fluid cell with an electro-motive force practically constant. Carbon and zinc plates dip into a solution of iodine in iodide of zinc, the iodine preventing polarization. The zinc should not be amalgamated, and should be removed from the solution when the cell is not working. As tested by a quadrant electrometer, the electro-motive force was very approximately one volt, and was hardly diminished, even after half an hour's short-circuiting.

Cast Iron in the Bunsen Battery. — An endeavor has been made in Germany to replace the carbon in the Bunsen cell by cast iron. In this couple, says the *Electrician*, the iron plunged in concentrated azotic (nitric) acid at first assumes a passive state; after a certain time, however, the concentration of the liquid diminishes, and the iron dissolves with effervescence, and the cell has to be unmounted at once. Dr. Velsmann, however, has found a means for remedying this by adding silicon. He thus obtains a metal which remains inactive, and the electro-motive power of the battery is not diminished. The addition of silicon permits also of more nitric acid being used.

SANITARY NOTES.

Fungi and Diphtheria. — An English medical journal reports the following suggestive facts: A certain house, which had previously been dry, and its inhabitants in good health, suffered an extensive soaking with water during a heavy storm, after the gutters had been in some way thrown out of position. The walls of a room in which three young children slept were saturated, and in the damp wall-paper mould soon made its appearance, followed by small clusters of fungi. For several weeks, while the development of the unwholesome vegetation was going on, the children occupied the room without apparent harm, but immediately after the sprouting of the little toadstools diphtheria attacked them. The drainage of the house was excellent, and, so far as could be seen, the only external circumstance connected with the outbreak of the disease was the appearance of the fungoid growth. It has before been held that diphtheria is caused by the sporules of other plants of the kind, as the oidium of the grape and the potato-rot plant, and it is quite probable that the spores of many parasites may have the power of producing similar symptoms. The ordinary dry-rot fungus, which in old houses attains an extraordinary size and strength, may, perhaps, at times, be the instrument of fatal infection, and the efforts of pathologists to trace this fearful disease to its source should not be suspended until all these conditions have been taken into account.

Dean Stanley's Death and Bad Plumbing. — It has been asserted in England that Dean Stanley's death was at least accelerated by defects in the drainage of the Deanery. The *Lancet* says that while the popular impression is not capable of proof, it is certain that the drains were in an unsafe condition. It is considered probable that noxious gases escaped into the Dean's library, where he worked, from an ill-constructed and unventilated water-closet adjoining. Prominent defects were the absence of traps between the house and sewers and want of ventilation, while one of the water-closets was sufficiently bad to occasion some slight nuisance. Dean Stanley's successor, Dr. Bradley, has taken warning from the exposure of these defects, and the drainage of the Deanery has been reconstructed.

Hints Concerning Small-Pox. — The recent increase of small-pox in many parts of the country calls for increased attention to the means of defence against the pest. The following extracts from the circular issued by the Board of Health of New York city are worth reprinting for the benefit of our readers: —

"If your children have not been vaccinated, have them vaccinated immediately.

"If they have been vaccinated, and the vaccination did not take with any one of them, have it repeated at once.

"If any member of your family has been vaccinated but once, and that a number of years ago, have a fresh vaccination now.

"It is wise to be vaccinated once in every seven years, though this is not, perhaps, absolutely necessary.

"Revaccination is absolutely necessary for those who have only been vaccinated in infancy, and are now over fifteen years of age."

The Antiquity of Food Adulteration. — Upwards of two hundred years ago a cynical poet, Cornelius May, wrote thus on the "The Knavery of the World: " —

"Thy baker and thy brewer
Do wrong thee night and morn,
And thy miller he doth grind thee
In the grinding of thy corn.
Thy goldsmith and thy jeweller
Are leagued in knavish sort,
And the ell-board of thy tailor,
It is an inch too short."

Laws against adulteration date back to the time of Edward the Confessor, if not earlier, and it is remarkable that in many cases the same ingredients of adulteration appear to have been in use for centuries.

Mortality Statistics. — According to the *Sanitarian*, the healthiest city in the Union is Utica, with a death rate of only 3.2 per thousand. New Haven and Portland come next. At the other end of the list we find Charleston is the most unhealthy, having a death rate of 46.8. The most unhealthy city in the world is St. Petersburg, where the death rate reached 51.4. Boston had a death rate at the same time of 30.5.

Poisonous Cosmetics. — The sad death of a young lady in Buffalo from lead poisoning, caused by the use of cosmetics, has again directed public attention to this subject. Dr. Hammond states that such cases are by no means so rare as is generally supposed, but they seldom find their way into print. In many cases, no doubt, the proud victim prefers to suffer in silence rather than confess her folly, and warn her friends. A stringent law should be enacted to prevent and punish the sale of cosmetics containing lead, and frequent analyses should be made of those offered for sale as harmless.

SCIENTIFIC BREVITIES.

Ruling a Million Lines to the Inch. — The famous Nobert has been outdone on this side of the Atlantic. Mr. S. Fasoldt says, in a communication to the *American Journal of Microscopy*: I have ruled plates up to 1,000,000 lines to the inch, one of which was purchased by the U. S. Government at Washington. These plates show lines truly and fairly ruled, as far as lenses are able to resolve, and above this point the *spectral* appearance of the bands in regular succeeding colors (when examined as an opaque object) shows, beyond doubt, that each band contains fairly ruled lines up to the 1,000,000 band. I do not believe I will ever attempt to rule higher than 1,000,000 lines to the inch, as, from my practical experience and judgment, I have concluded that that is the limit of ruling.

THE ATOMIC WEIGHT OF PLATINUM. — Hitherto the atomic weight of platinum has been considered greater than that of gold; but according to the "periodic law" it should be less. K. Seubert has recently made a new and careful determination, by which he finds it to be actually less; gold being 196.2, he finds platinum to be only 194.46. So that hereafter platinum will take the place which would be accorded to it if its properties were taken into consideration, and the atomic weight of the three metals leading in value will stand as follows: iridium, platinum, gold.

THE YOUNGEST OF SCIENTISTS. — Probably the youngest man in the world who has attained scientific celebrity is Frank Hatton, the son of Joseph Hatton, an English novelist and journalist. Frank, though but twenty years old, is the leading British authority upon the action of gases on bacteria, and has carried off the Frankland prize for the best original investigation involving gas analysis. This talented youngster has been sent out to North Borneo and the Malay Archipelago on a scientific and mineral exploration, this probably being the first instance on record where so important an enterprise was entrusted to a stripling.

ACTINIUM, A NEW METAL. — Dr. Phipson has been investigating the white pigment described in our September number as changing its color during the day. He believes that he has found in it a new metal, to which he gives the name of *Actinium*, because it is acted upon by sunlight. In the *Chemical News* he describes his method of separating the oxide and sulphide of his new metal. The former has a pale fawn-colored tint, and is not affected by the direct rays of the sun. The sulphide is of a pale canary-yellow color, and when exposed to the direct rays of the sun it darkens and becomes quite black in about twenty minutes, except in those places where it is protected by a piece of ordinary window glass. About four per cent. of the sulphide was obtained from the white pigment.

SILICATE OF SODA FOR EXTINGUISHING FIRES. — Some experiments have lately been made in London in extinguishing fires with water and sodium silicate. Two piles of lumber, each nine feet long, seven feet high, and four feet deep, were filled in with straw, well saturated with petroleum and benzine in equal quantities, and ignited. After burning for five minutes, operations were commenced by throwing water on one and sodium silicate on the other. In the course of about one minute the fire treated with the silicate was extinguished, while that treated with water did not give in till about four minutes. And it was further found that about twelve gallons of the silicate and twenty-two gallons of water had been used.

TELEPHONE OPERATORS. — Any one who can hear and speak can use a telephone, but *The Operator* says: It takes nerve, patience, and good temper to make a *good* telephone operator, and those who lack any one of these essentials had better let the profession alone. Only one person out of five, on the average, has a good telephone voice. They speak too low or too loud. Not more than one person out of twenty has the voice which a telephone operator should have, — pleasant, even, plain, and devoid of peculiarities. Let one of the best operators talk to you over twenty miles of wire, and you will fancy that he stands beside you.

A NEW THERMOMETER. — The Thalpotasimer is the name of a new thermometer, brought out in England, for the purpose of rating temperatures of liquids which are being raised to points above the range of the ordinary thermometers or pyrometers. It consists of a tube containing special fluids (according to the temperature to be noted; water is employed for points below 450°). These fluids vaporize and act on the machinery in the upper part, which rns the hands on a dial face. The tube is always within the liquid to be tested, and a close opening in the cover of the pot or vessel allows the projection of the dial face above. This does away with the uncertainty and unreliability attendant upon the old method of taking the thermometer out of the mass to note the temperature. To the dial face is also attached an alarm gauge, which gives signal of a temperature higher than desired, or of any sudden change in temperature.

Practical Chemistry and the Arts.

THE ELECTRIC RAILWAY.

WE learn from foreign journals that Dr. Siemens has finished a second electric railway in the suburbs of Berlin. The new line is constructed with all the improvements that have been suggested by the operation of the one in the city, and is said to work satisfactorily in every respect. The line extends from Charlottenburg to Spandau, a distance of about five miles.

The Siemens electrical railway, which was a part of the recent electrical exhibition at Paris, has been transferred to England, where it attracts much attention. The improvements which have been made in the system since it was first brought before the public are of interest as showing how the difficulties already encountered have been overcome, and as affording encouragement that any new obstacles to its perfect success will be surmounted by the ingenuity of the inventor. The following sketch of the history of the railway, which we take from the *American Architect*, will give our readers an idea of what has already been accomplished: —

Under the Siemens system three rails constituted the track, of which the middle served to conduct the electric force to the engine or car, while the others were used for conveying the return current; the connection between the two taking place through the wheels and the machinery connected with them, and the extent of the electric circuit diminishing or increasing as the car approached or departed from the station where the generator was established. In Berlin, Brussels, and other places where the apparatus was first exhibited, the track was isolated, and the rails out of the way of the public; but in Paris it was necessary to lay the road at the ground level, in a spot frequented by multitudes of people, so that there was serious danger that some one might walk across it while the current was passing, and, happening to put one foot on the return rail, and the other on that in the middle, might direct the current through his own body, injuring him seriously, as well as stopping the movement of any cars which were travelling further up the track. To avoid this danger the middle rail was omitted, and its place as conductor of the upward current was supplied by a strong telegraph wire suspended overhead, and kept in communication with the car travelling below by means of a little runner, towed, so to speak, by the car; but it was found impossible to keep it from falling off, and at the same time the mud carried upon the rails by the passing vehicles prevented close contact between them and the wheels of the car, often interrupting the current altogether and stopping the machinery. These difficulties were finally obviated by arranging overhead conductors for both the upward and the return currents, consisting, not of wires, but of brass tubes suspended at a convenient height above the track, and split on the under side through their whole length. In the tubes moved cylinders of brass, connected with the car below by rods which moved in the continuous open seam on the under side. By this means uninterrupted contact could be maintained without danger of interference from passing persons or vehicles, and the railway was operated with complete success.

FOOL'S GOLD.

"ALL that glitters is not gold" is an old adage which too many have learned by sad experience to be true. Beside the usual general applications, referring to the glitter and tinsel of worldly affairs, it has a literal and scientific application no less valuable. Scarcely a day passes that chemists, mineralogists, and editors do not receive from some deluded individual a specimen of some yellow stuff to analyze. It is evident that they think that it is gold, although usually too cautious to say so. Nine times out of ten, at least, this yellow material is a sulphide of iron, to which, for this very reason, the name has been given that heads our article, — "fool's gold." In scientific works it is called iron pyrites. The story is often told of a man who brought a quantity of this mineral to a chemist, who threw some of it on a red-hot shovel, and told him to smell the fumes. Under these conditions sulphurous fumes are evolved, and the disgust of the poor victim can well be imagined as he recognized the smell of brimstone for, as he said, he had just married a widow with a half acre of this kind of earth. Like many another fortune-seeker, he discovered his mistake too late.

INDUSTRIAL MEMORANDA.

COTTON AND STRAW HOUSES. — It is said that fire-proof houses can be built of cotton and straw. In preparing these materials, raw cotton of inferior quality, the scattered refuse of plantations and sweepings of factories, are mixed and converted into a paste, which becomes as hard as stone, and then is called architectural cotton. It may be made in large slabs, whereby the building of a house would be rapid in comparison with the practice of laying brick after brick, and at about one third the cost. For the other part wheat straw is treated in a way already known, and converted into pasteboard. The sheets thus prepared are soaked in a solution which hardens the fibres, and they are then compressed under enormous power into beams and boards of any required size. The effect of the soaking is said to render them difficult of combustion.

UTILIZING ROTTEN EGGS. — In the north of Russia some wholesale dealers have each season to dispose of more than 500,000 bad eggs. Dr. C. O. Cech, of Berlin, proposes to extract the so-called egg-oil, which may be used in the manufacture of soaps. He also suggests that putrid eggs may be applied in the manufacture of artificial manure.

PYRONOME. — This is a new explosive compound, invented by M. Sandoy, for which the *Moniteur des Produits Chimiques* gives the following formula: Saltpetre, 69 parts; washed sulphur, 9 parts; charcoal, 10 parts; metallic antimony, 8 parts; chlorate of potash, 5 parts; rye flour, 4 parts chromate of potash, a few centigrams. These are to be mixed in an equal volume of water at the boiling point, and the mass is evaporated down to a paste, dried, and powdered as wanted. This mixture is said to be much cheaper than dynamite.

ENGLISH APPRECIATION OF AMERICAN MECHANICS. — The London *Iron* says: There are many articles in the production of which greater taste might be cultivated to much advantage, a matter in which, as a nation, we have never excelled, and in respect of which several foreign countries are a long way ahead of us. An example which will readily present itself to many minds is to be found

in the superiority of the tools which are now so largely imported into this country from America, and which, while remarkable for their quality and finish, are much less costly than those of English production.

An Iron-Clad Contract. — A ship-building firm on the Thames has undertaken to build an iron-clad of novel construction for the Brazilian Government, under a contract which includes a novel series of penalty clauses. The ship is designed to steam fifteen knots per hour, but if she fails by a quarter of a knot a penalty of £2000 is to be paid; and so for every quarter of a knot in an ascending scale, until for a short-coming of a knot of speed per hour a penalty of £16,000 will have to be paid; while the loss of a knot and a quarter will involve a fine of £32,000; and if a speed of less than thirteen and a half knots per hour can only be attained, a sum equal to one sixth of the total price of the vessel will be forfeited. If, again, the vessel when launched draws an inch of water more than the draught named in the contract, £1000 is to be deducted from the price to be paid for the ship and so on, again, in ascending scale, until a penalty of £25,000 is reached for six inches' excess of draught.

The New Bell for St. Paul's. — The gigantic new bell for St. Paul's, London, weighing 17½ tons, was recently cast at Loughborough. About 21 tons of material were prepared, and when the three furnaces had been opened the streams of molten metal poured out for four minutes and three quarters before the huge casting was filled. The new bell will be the largest in Great Britain. To give an idea of its size, the following comparisons are made: the first "Big Ben" at Westminster weighed 15 tons 8 cwt., and the second 2 tons less; "Great Peter" at York weighs 10¾ tons; "Great Tom" at Lincoln, 5½; the former big bell at St. Paul's weighed 5 tons 13 cwt.; that at Olmutz weighs 17 tons 18 cwt.; that at Vienna 17 tons 14 cwt.; that at Erfurt 13 tons 15 cwt.; that at Sens 13 tons; that at Paris 12 tons.

Safety Envelopes. — *The Paper Trade Journal* describes a compound used for the preparation of what are termed safety envelopes. That part of the envelope covered by the flap is treated with a solution of chromic acid, ammonia, sulphuric acid, sulphate of copper, and fine white paper. The flap itself is coated with a solution of isinglass in acetic acid, and when this is moistened and pressed down on the under part of the envelope a solid cement is formed, entirely insoluble in acids, alkalies, hot or cold water, steam, etc.

Sulphur in Tennessee. — Since all the sulphur used in this country is imported, the *New York Mining Record* says that it seems strange that little or nothing has been done to develop our sulphur deposits, such, for instance, as the rich sulphuret ores in the copper regions of East Tennessee, which contain forty to fifty per cent. of sulphur.

Water Gas. — Notwithstanding the prejudice against water gas, it is now used in fifty cities and towns in the United States. In Baltimore it has nearly driven coal gas out.

Automatic Fire-Alarm. — A magneto-electrical alarm thermometer has been patented by M. Th. Finger, of Coblentz, France. It consists of a mercury column, on which floats a small staff of magnetic steel. When reaching a certain height this staff causes a magnetic needle to abandon its ordinary position, thus indirectly closing a galvanic battery, which gives the alarm. The alarm can be set at any desired temperature.

Manufacture of Sulphur. — Instead of the crude method, still common in Sicily, of roasting sulphur ore in stacks, or *calcaroni*, to extract the sulphur, MM. de la Tour du Breuil have lately adopted the practice of treating the ore with water which has its boiling point raised by presence of a salt, namely, chloride of calcium (sixty per cent.). There are two rectangular boilers, heated alternately. While liquation is going on in one (during two hours) the other is charged afresh, and the work proceeds without interruption. The expense of extraction is much reduced, the extraction is very complete, the sulphur produced is nearly pure, and the work may be carried on all the year round, whereas at present Italian law allows of the process with *calcaroni* only from the end of June till the 15th of February, on account of sulphurous acid given off.

ANALYTICAL NOTES.

The Permanganate Test for Water. — J. A. Starr, in the *Canada Pharmaceutical Journal*, has shown that 1 drop of lager beer in 500 drops of distilled water will discharge the color of the permanganate solution very rapidly. Even 1 drop in 1000 drops discharged the color, but more slowly. If water be brought for analysis in beer bottles, it might be condemned unjustly by this test.

Estimation of Chlorides in Bromides. — The usual method consists in precipitating both bromine and chlorine with nitrate of silver, weighing the dry precipitate, and afterwards converting it all into chloride of silver by heating it in a current of chlorine gas. This method is too tedious for commercial work, and has been superseded by a volumetric method which can be performed in half an hour. It is, however, only applicable to soluble salts containing but one metal.

When it is required to determine the amount of potassium chloride in potassium bromide, one gram of the dry salt is dissolved in water, a few drops of a saturated solution of neutral potassium chromate added, and a decinormal solution of nitrate of silver run in until the red color of chromate of silver becomes permanent. The decinormal silver solution contains 17 grams of nitrate of silver to the liter, and each cubic centimeter will precipitate 3.55 mg. of chlorine, or 8. mg. of bromine; hence a gram of pure potassium bromine will require but 84.0 cc. of this solution to saturate it. A gram of potassium chloride, on the other hand, will require 134.2 cc., and a mixture of the two will require more than 84, but less than 134 cc. If the bromide contains 1 per cent. of chloride, it will require 84.5 cc. of silver, 2 per cent. 85 cc., and so on.

Sodium bromide requires 97 cc. of silver, and each per cent. of chloride increases it by 0.74 cc. Ammonium bromide requires 102 cc., and each per cent. of chloride is represented by 1 cc. of silver solution.

Solubility of Chloride of Silver. — Prof. J. P. Cooke has found that one liter of boiling water will dissolve three mg. of chloride of silver, which is only half as soluble in hydrochloric acid. Hence, in accurate analyses, he advises washing the precipitate at first with a dilute solution of nitrate of silver, and afterwards with pure water.

Estimation of Chromic Acid. — Richter describes, in the *Chemiker Zeitung*, a simple method of determining chromic acid in the neutral alkaline chromates. He dissolves one gram of the salt in water, and adds to it enough of a standard solution of nitrate of silver to unite with all the chromic acid to form chromate of silver, and leave a slight excess of nitrate of silver. The solution is now diluted to 250 cc., and 50 or 100 cc. taken out and filtered. In the filtrate the excess of silver is determined by means of a standard solution of common salt. Deducting the excess of silver found from the total quantity added will give the amount required to satisfy the chromic acid. By multiplying the weight of nitrate of silver required by the factor 0.57206, we have the percentage of potassium chromate in the sample. If chlorides are present they must first be estimated, and due allowance made for them. Sulphates do not interfere with the operation.

PRACTICAL RECIPES.

Hard Putty. — The *Carriage, Monthly* gives the following for a hard putty that will dry in one day: Take the whitening, mash all the lumps out on the stone, and mix into a stiff paste by adding equal parts of japan and rubbing varnish; then add as much keg-lead as you think will make it work free with the knife; then add the rest of the whitening until you have it to suit you. This will sand-paper well with one day's drying. If you want putty that will dry quicker, take dry white lead and mix with equal parts of japan and varnish, to which add a few drops of turpentine. This is very soft for puttying, but can be sand-papered in from two to three hours, it becoming perfectly hard in that time.

A Composition Imitating Gold. — In France manufacturers of jewelry and other fine wares are now using very largely an imitation of gold which is composed as follows: 100 parts, by weight, of copper of the purest quality, 14 of zinc or tin, 6 of magnesia, 3.6 of sal ammoniac, limestone, and cream of tartar. The copper is first melted, then the magnesia; sal ammoniac, limestone, and cream of tartar in powder are added separately and gradually. The whole mass is kept stirred for half an hour, the zinc or tin being dropped in piece by piece, the stirring being kept up till they melt. Finally, the crucible is covered and the mass kept in fusion thirty-five minutes, and, the scum being removed, the metal is poured into moulds, and is then ready for use. The alloy thus made is represented as being fine-grained, malleable, taking a high polish, and not easily oxidized.

A Strong Cement for Mica, Glass, Metals, etc. — Take equal weights of Nelson's crystal gelatine and of cut Penang isinglass, and allow them to macerate in cold distilled water for at least 24 hours. Drain the expanded gelatinous shreds thoroughly, first in a colander, and then in an absorbeni cloth. Dissolve the whole in the smallest possible quantity of spirits of wine, — methylated spirit free from gum or color will do, — of not less than 54° over proof, by the aid of gentle heat.

To every 10 fluid ounces of this solution, add — previously dissolved in spirit containing 5 per cent. of acetic ether — 1 drachm of mastic, 3 of sandarac, and 2 of ammoniacum, taking care to mix the whole very perfectly before pouring into bottles and putting aside to cool.

In using this cement it is merely necessary to render it fluid by a gentle heat, and to warm the surface intended to be united before applying the cement to *both*, pressing them together, and wiping off any superfluity. In 24 hours' time the joint will sustain any moderate amount of force without giving way, and after two or three days a severe strain, or even hot liquids, may be applied without injury.

Liquid Slating for Blackboards. — The following is an excellent formula: —

Alcohol, 98 per cent.	1 gallon.
Gum shellac	1 pound.
Ivory black	8 ounces.
Emery flour	5 "
Ultramarine	4 "

Mix and dissolve; keep corked. Shake, and apply with a brush to plastered walls.

Preserving-Fluid for Meat. — Wickersheimer has patented a new preservative fluid, — this time for keeping meat. Its composition is as follows: Thirty-six grams of potassa, fifteen grams of chloride of sodium, and sixty grams of alum are dissolved in three liters of water, the solution heated to 50° C. (122° F.), and afterwards nine grams of salicylic acid added, together with forty-five grams of methylic alcohol and two hundred and fifty grams of glycerine. In smaller animals, one hundred grams of the liquid are used for every kilogram of weight of body; in larger animals, the amount may be re-

duced to forty grams per kilogram. The liquid is either injected before slaughtering, directly into the heart, or, after slaughtering, in the carotid. In the case of neat cattle and hogs, three grams of saltpetre are added to the above liquid. The preserving power of the latter may be augmented by increasing the methylic alcohol to twenty grams, salicylic acid to twelve grams, and glycerine to four hundred and fifty grams per liter of liquid. The meat may then be preserved two or three weeks entirely without odor.

Agriculture.

INTERESTING FARM ANALYSIS.

With the view of ascertaining the comparative nitrogenous value of good field soil and swamp muck, analysis was made at the farm Winnekeni, in December, of these substances, selected under the following conditions: The soil was taken from a field now in grass which has been under experiment for a period of fifteen years. During this time no animal manures of any kind have been applied to it, but it has received dressings of artificial fertilizers made at the farm, consisting of superphosphates, nitrate of soda, muriate and nitrate of potash, in fixed or known amounts, applied with the design of securing answers to certain inquiries.

The field has produced successive crops of wheat, rye, corn, and grass; the latter crop during the past seven years. It has not been disturbed by the plough during that time. The crops have been large, and this, as one of a long series of experiments on the farm, has been important and instructive. It only remains to say that no manures of any kind have been applied to the field for eight years, and that the sample of soil was taken six inches below the sward, and from the centre of the field. It gave the following results: —

Organic substances	8.21
Ash, sand, etc.	72.61
Water	19.18
	100.00
Nitrogen	0.27
Equal to ammonia	0.32

One ton of this soil (2000 lbs.) contains: —

Nitrogen	5.40 lbs.
Equal to ammonia	6.40 "

One ton water-free: —

Nitrogen	6.68
Equal to ammonia	7.90

Muck of superior quality taken from the meadow, ten rods from the upland where the soil was obtained, gave results as follows: —

Organic (vegetable matter)	19.65
Ash, sand, etc.	2.99
Water	77.36
	100.00
Nitrogen	0.56
Equal to ammonia	0.68

One ton of this muck, water-free, contains of

Nitrogen	49.40 lbs.

We think this is the first instance in which comparative analysis have been undertaken on the same farm of *soil* and *muck*, the samples having been secured within a radius of fifteen rods. The results are certainly interesting and important, and afford at a glance information long desired by farmers. We have given in a paper on "Swamp Muck," read at the late meeting of the Massachusetts State Board of Agriculture, a full statement regarding their actual and comparative values, and therefore but little need be said in detail regarding them.

The points worthy of notice are the near approximation of the amount of nitrogen in the farm muck and in fresh cow dung at the barn, as presented in an analysis in the paper referred to; and this is well calculated to mislead unless some explanations are given. The analyses do not show the comparative value of *muck* and *manure*, inasmuch as manure in its *fresh* condition holds less available nitrogen than when it has undergone natural fermentative changes. Also, fresh cow dung does not represent *manure* in its best condition with admixture of liquid excrement, as has been shown elsewhere. The comparison is interesting as showing the *apparent* approximation in manurial value of the two substances so far as potential nitrogen is concerned. The specimen of muck from the farm meadow gives an unusually high percentage of nitrogen, and as the farm has been under experiment with nitrogenous manures for a quarter of a century suspicions arise that the muck bed has been influenced by the farm drainage. The upland all inclines towards the meadow, which fact strengthens the suspicion.

The soil analysis shows that the per cent. of nitrogen it contains is about half as large as that held in the muck. As the field from which it was taken has not received any nitrogenous or other fertilizers for a period of eight years (during which time it has been constantly cropped), it is not probable that much remains of that which it has received in former years. The result gives force to the more recent views of chemists that soils derive much of their nitrogen from rain-water and other natural sources.

Beginning at the farm barn, we have in these results the nitrogenous value of the solid excrement of animals, derived from the crops produced, and also the nitrogenous condition of the soil after eight annual croppings, and, further, the nitrogenous constituent of the muck deposited in the meadow contiguous. It will be interesting to extend these experiments to examinations of other fields and other points in the meadow, and also to barn manures under differing conditions. These labors we shall undertake speedily, and will give the results to the readers of the Journal. The analysis of the cow dung is not here presented, but may be found in the paper which will be published in the forthcoming Report of the Secretary of the Massachusetts Board of Agriculture; and it has also been published in the *New England Farmer*, of this city.

ANALYSIS OF ASHES.

John Lane, Esq., of Bridgewater, Mass., has sent to us samples of ashes purchased in New Orleans, said to be obtained from burning the hulls or outer coverings of the cotton seed, a waste product of the cotton-seed oil mills. As a matter of interest, we present the results of analysis. The sample gave the following percentage of moisture and alkalies: —

Moisture	17.27
Potash	30.51

Equivalent of carbonate of potash 44.76 per cent

This result shows that these ashes are of a very unusual character, containing as they do nearly one third of their weight in caustic alkali. We have never before seen any ashes offered in the market as a sale commodity corresponding with these, and we only regret that the quantity is not equal to the wants of farmers everywhere. For dissolving bones they must prove very valuable, as with a proper admixture fresh bones of the common forms could be readily disintegrated, and the fat saponified and rendered soluble. For general farm purposes, as adjuncts to composts and other forms of fertilizers, such ashes would prove exceedingly useful. The price paid for them we did not learn definitely, but understood it to be but little more than is paid for good wood ashes at the North.

A car-load of wood ashes recently purchased by us for farm use, coming from Canada, gave upon analysis of a sample the following percentage of potash and moisture: —

Potash	9.57
Moisture	3.48

This result is very satisfactory, and the price paid (34 cents per bushel, 50 lbs.) is such as to make them desirable for agricultural purposes. The worthless ashes which have reached this city in vessels from "down East" ports have deceived many, and discouraged them from purchasing the article when offered from any source. Ashes should be bought only after their value is known from analysis, and the price should always be based upon accurate determinations in the laboratory.

SALT IN SOILS.

The amount of common salt which is deposited upon an acre of land at Winnekeni Farm is about 16½ lbs. per annum. This comes from the rainfall, and varies each year in accordance with the amount of rain and the direction and violence of the winds. Whilst the average is about 16½ lbs., in some years the amount is considerably increased. This is due to the prevalence of heavy storms, with the wind east or northeast, which brings fog and fine spray from the ocean, twelve miles distant. This salt probably in no way favors fertility, as it is not acceptable as plant food, unless in the case of the onion, asparagus, or some other crops specially adapted to localities near the sea. Salt is speedily eliminated from soils in virtue of its easy solubility in water. The rains wash it away, so that no accumulation of the substance is possible, on any uplands.

FRUITS IN CALIFORNIA.

Our friends on the Pacific shore have been so much in the habit of boasting of the fine quality as well as the enormous quantity of their fruits that they will be disgusted at having their claims to preëminence in the former respect disputed; but the following remarks on the subject by Mr. Henry W. Elliott, of the Smithsonian Institution, recently communicated to the *Nation*, are evidently careful and discriminating, and must carry with them far more weight than the extravagant statements of the average newspaper writer: —

During the last fifteen years I have been actively engaged in the maintenance of a pomological garden, near Cleveland, Ohio, on the lake shore, and am now; and in this period I have had occasion to make many visits to California, Oregon, and Washington Territory, as well as British Columbia. Naturally, wherever and whenever I met samples of fruit, I

took a direct personal interest in their character, using the basis of my home-grown specimens for comparison. Briefly summed up with regard to California fruit alone, as compared with that of New England, of the Genesee Valley in New York, and of Michigan, together with the zone of the lower lake region where I live, the following synopsis may be interesting: —

Apples and pears . .	Decidedly inferior to	ours	in flavor.
Peaches (on the low lands)	" inferior "		"
Peaches (on the mountain slopes)	" superior "		"
Plums apricots, and nectarines	" equal "		"
Grapes (as a special crop)	" inferior "		"
Grapes (as an average crop) .	" superior "		"

I know that the Californian will rest content under almost any criticism sooner than a reflection upon the flavor of his vintage; but I am free to maintain that when a well-ripened bunch of Delaware, Catawba, or Concord grapes, taken from the trellises of the southern shore of Lake Erie, is brought into direct contrast with the very finest of the large variety known to the vineyards of the Golden State, the impartial and just judge will award the best flavor and aroma to the Eastern grape. But when you consider the whole average quality of the entire crop as it annually ripens in California, and compare it with that which we have to show for our entire vintage, then the scale is turned in favor of the Western clusters. All their grapes ripen, and they ripen every year; it is just the reverse with us.

The apples and pears of Oregon, Washington Territory, and Lower British Columbia are simple in their excellence and fine flavor, — as good as our own; their plums, apricots, and nectarines superior to ours, and equal to the best Canadian orchards; while the peach and the grape are not successful on their soils and in their early October frosts. With regard to cherries and all the small fruits, I may say without reservation that their quality on the Pacific coast is fully equal to our own in excellence. Also, in this connection, I may record my verdict in favor of the Florida orange contrasted with that which is so extensively cultivated in Lower California, at and around Los Angeles especially. When the size and flavor of the products of the vegetable garden are considered, the general average in California is a very high one, especially so in the cultivated sections of Northern California, Oregon, and Puget Sound.

THE MODEL COW.

In a report on milch cows made to the Hampshire County Agricultural Society, President Stockbridge describes his model animal as follows: —

My cow in size must be large. All dairy qualities may exist in a large animal, and, other things being equal, she will yield the greater quantity of milk, while her general care will be no more expensive than a small one. She must give every indication of possessing a strong, vigorous constitution, must be in perfect health, with every organ and function in normal activity: this, in the first place, because her product should be healthy, and, in the second, because there is no animal on the farm of which so much hard, unintermitted work is required as of the good milch cow. We expect her to nourish her young and bring it forth at regular intervals, and from ten to eleven months of the year, morning and evening, give us the flowing pail of milk. However large of size, she must be fine; hair fine and soft, skin thin and elastic, light boned in the legs, head, neck, and shoulders, but with frame broad in the region of the pelvis and of the chest. There should be ample development of the blood-vessels and connective tissues of the udder, and this all-important organ should be long and broad rather than deep, and when not distended with milk as soft, including skin and gland, as the finest sponge. Her teats must be large and placed well out toward the corners of a square udder, and look as if made for use and not ornament.

SEEDS AND CUTTINGS.

How to Pile Firewood. — A wood dealer writes to a Detroit paper as follows: I have sold wood for over forty years in Michigan, and I find that when split wood is corded bark up it remains on until I sell and measure up the wood; but if it is piled bark down, the bark falls off and measures nothing; besides, there is more heat in the bark than in the sap of the log. The most and best ashes are also in the bark. I have on my place now some maple wood that was chopped nine years ago and corded bark up, and the bark would hold on if I were to draw the wood to Saginaw, a distance of eighteen miles. Where the bark is piled down the water runs in around the wood and makes it dozy, wet, and heavy. Railroad companies would save thousands of dollars by piling their wood bark up.

The Value of Hog Manure. — A recent writer on hog-raising says: Much importance is given to the value of hog manure. The value of any manure depends on the food given to the animal. The carefully prepared table of Mr. Lawes gives the value of manure from a ton of corn meal fed to pigs at $6.65. Now a pig which in nine months weighs 350 pounds will have eaten about 1400 pounds of meal or 24 bushels of corn. If 400 pounds of meal or seven bushels of corn make 100 pounds of pork, the manure made by the pig should be worth $4.65; or, in other words, in the production of every hundred pounds of pork (live weight) fed on corn meal we get about $1.40 worth of manure; or if the pig dresses 85 per cent. or more of its live weight, we get for every hundred pounds of pork manure worth $1.78, which adds to the general profit 1¾ cents a pound. So that if the carcass sold, as it should, at 8½ cents per pound, the manure added would make 10¼ cents per pound, for 300 pounds of pork, equaling $37.50, from which subtract six bushels of corn at 75 cents, and we have a profit of $18.50.

Carbonized Bran for Fruit Packing. — The California Fruit Shipping Co., of Vacaville, Cal., furnishes the following information in reply to a query from an Eastern paper: "Carbonized bran" is made from ordinary wheat bran burned in a retort, under which treatment all moisture is driven off and a species of charcoal is obtained. This coal bran is used in packing green fruits for long shipment, and the patentees claim that grapes, when thus packed, may be shipped from this coast to Eastern markets by slow freight with safety, thus avoiding the high charges on fast freight. The company claims that tomatoes have been kept for six weeks when packed in this bran. It is stated that peaches will keep twice as long as under ordinary conditions, but this fruit, having a porous skin, is not as well preserved as other fruits.

Potash Salts in Agriculture. — According to Professor Märcker, failures in the use of potash salts are often due to the fact that artificial manurial matters are sometimes applied without the simultaneous use of nitrogenous and phosphatic bodies. It is not to be expected that potassium salts can act advantageously on all soils and in all methods of cultivation by the direct efficacy of their potash. As all potassium salts are converted in the soil into silicates, it is indifferent, in case of a deficiency of potash, whether it is supplied as sulphate or chloride. Potatoes, beet-root, and tobacco form exceptions, and are injuriously affected by potassium chloride. The magnesium chloride present in crude Stassfurt salts is, in dilute solutions, not more hurtful than equivalent quantities of potassium or sodium chloride.

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor*

BOSTON, FEBRUARY 1, 1882.

TRANSATLANTIC "EXPRESS" TRAVEL.

Many of our readers have doubtless seen in the papers of the day the outlines of a plan devised by certain New York capitalists for expediting and otherwise improving steamship travel across the Atlantic. Nearly ten years ago (in November, 1872, to be exact) we expressed the opinion that there was great room for improvement on "the Atlantic ferry," and suggested that the reform would probably have to be inaugurated by a line planned and conducted according to "American" ideas of comfort in travel. Our local steamboats, plying on river, lake, and coastwise routes, are immeasurably in advance of anything on European waters; and when we build ocean steamships of a distinctively Yankee type, they will equally surpass those of foreign pattern. This, we are told, the capitalists mentioned above propose to do. "What Pullman's parlor cars are in the railway service, the new ships will be on the ocean." They are to be constructed with equal regard to speed, safety, and comfort. Built of steel, and with a more complete system of water-tight compartments than has been attempted heretofore, they will be staunch and unsinkable. As they will carry neither freight nor emigrants, the accommodations for passengers can be on a more liberal scale than is possible in the largest and best vessels now running. The rates of fare will necessarily be higher (though it is believed that they will not average $50 more than those now charged); but there are plenty of tourists and other travellers who would gladly pay double or treble for the gain in comfort, which is not now to be had at any price.

At present the passenger traffic is entirely subordinated to the transportation of freight. The latter is viewed as the main and "paying" business, the former being secondary and comparatively unremunerative. During a few months in the summer a good many people want to get across the ocean, and the steamship companies make certain limited arrangements for carrying them. The ships are virtually freight-trains, but, like some such trains on our railways, they attach a passenger car for travellers who are willing to resort to such inferior conveyance for the sake of getting over the road. The ship is literally nothing but a huge freight-boat with a part of its upper deck fitted up for passengers. Of course such travel must be both slow and uncomfortable. Freight-boats cannot be run at the same speed as vessels built exclusively for carrying passengers, no more than freight-trains can be expected to run as fast as express trains. It is a marvel that people have so long tolerated on transatlantic routes this wretched sort of travel by "freight-train with passenger car attached." It is partly because they have not thoroughly understood what it was, and partly because the business has been almost entirely in the hands of our stolid British cousins, who never change their ways until they are compelled to do so. In this business they

have made some improvement, of which they have boasted so much that it has deluded the general public into believing that substantial progress has been made, and all that could reasonably be expected. Ships have been made bigger and faster and slightly less dirty and disagreeable, — much as our cattle cars have been bettered in these latter years, — but no change has been made in the main plan and purpose of the vessels. They are only improved freight-boats, after all.

Let us hope that the new Yankee idea of express trains of Pullman cars for the great oceanic railway may be carried out, and that within a year or two it may be possible to make the trip in five days instead of from eight to ten, and with a gain in comfort more than proportional to the increase in speed. That it will "pay" when fairly established we cannot doubt. Many impecunious tourists will prefer to go by the new ships, even if they have to cut their stay abroad a little short, or to balance the account by greater economy in expenditure on shore. The old-fashioned British freight-trains will still find enough to do in their legitimate line; but only the poorest class of passengers, compelled by dire necessity, will patronize them. The great majority of travellers will no more think of crossing the ocean in them than they would now think of going by a freight or cattle train from Boston to Chicago or San Francisco.

PROFESSOR JOHN W. DRAPER.

This eminent scientist, who died on the 4th of January, in his seventy-first year, was born near Liverpool, England, but removed in early life to this country, and graduated in 1836, in the University of Pennsylvania, where he took the degree of M. D. Immediately after his graduation he was appointed Professor of Chemistry, Natural Philosophy, and Physiology in the Hampden-Sidney College, Virginia. During his residence there he was much occupied with scientific investigations, the results of many of which were published in scientific and medical journals. In 1839 he was called to the chair of Chemistry and Natural History in the academic department of the University of New York. In 1841 he was appointed Professor of Chemistry in the University Medical College, and in 1850 physiology was added to the chair of chemistry. He was long president of both the scientific and medical departments of the University.

He was the author of many literary works, among which may be mentioned a "Treatise on the Forces which Produce the Organization of Plants;" a "Textbook on Chemistry;" another on "Natural Philosophy;" and another on "Human Physiology," many editions of which have been published. His "History of the Intellectual Development of Europe," which appeared in 1852, was almost immediately republished in England, and translated into French, German, Italian, Polish, and Russian. In 1865, four lectures which he had delivered before the New York Historical Society were collected in a volume, under the title of "Thoughts on the Future Civil Policy of America;" and between 1867 and 1870 he brought out his "History of the American Civil War." His "Conflict between Science and Religion" attracted attention all over the world, and was translated into many languages. His last work was "Scientific Memoirs," published in 1878, containing papers on experiments made by him in the University of New York, between 1850 and 1870, chiefly in connection with light, radiant heat, and electricity.

In 1875 the American Academy of Science awarded Dr. Draper the Rumford medal for his discoveries in radiant energy. He was the first on this side of the Atlantic to follow up Fraunhofer's study of the solar spectrum by discovering new lines, and showing that they could be photographed. In like manner he carried the work of Daguerre farther than the Frenchman had dreamed of doing, by taking the first photographic portrait of a living subject. He showed that the decomposition of carbonic acid was accomplished by the yellow rays of light, and not, as had been supposed, by the violet. He also disproved the current notions as to the distribution of heat and chemical agency in the spectrum, by showing that all the colored spaces were equally warm, and that every ray, and not the violet alone, can produce chemical effects. These are but a few out of many of the important researches of Dr. Draper, which perhaps place him at the head of American scientists of the present century.

IMPURE ICE.

It is a popular notion that water purifies itself in the process of freezing, so that ice from lakes and streams liable to contamination may be used without danger to health. This is, however, a fallacy, and a writer in the Louisville *Medical News* refers to the fact that an alarming epidemic was lately traced to the use of ice taken from a contaminated pond. Pure ice is hardly second in importance to a pure water supply. The writer, referring particularly to the ice supplies of the sections around the northern lakes, says that much of the so-called northern lake ice is really obtained from small streams and rivers accessible to the surface drainage of the surrounding country. The ice for Chicago in particular is derived from the Desplaines River, close to which is a canal made so foul from sewage that no fish can live in it; and in its vicinity diphtheria and other diseases constantly prevail. Though there may be no direct surface communication between the canal and the river, there may be subterranean sources of contact, and in any case exhalations from the canal would be readily absorbed.

If the present winter continues to be as mild as it has been up to the time when we write this (the middle of January), the supply of ice from many of the usual sources in this part of New England is likely to be much below the average, if it is not entirely cut off. Should this be the case, there is reason to fear that ice may be taken wherever it can be found, and perhaps from localities of a suspicious character. It becomes the dealers in the article to be on their guard, and, if they have to obtain it from other than the regular sources, to satisfy themselves that the water is pure and wholesome. It also behooves all who are filling private ice-houses from small ponds and streams to exercise similar caution. In the present low state of many of the sources of supply, special care is necessary, as streams and ponds that are usually pure are more or less liable to contamination when the water is very low.

MEDICAL PRACTICE BY TELEPHONE.

We find the following paragraph in one of our medical exchanges: —

A physician of North Adams, Mass., is said to have successfully diagnosed and treated a case of croup, two miles away, by the help of the telephone. The croup cough of the child was distinctly transmitted.

This sets one to thinking of the possible influence that the telephone and kindred instruments may have upon the medical practice of the future. The time may come when the doctor will not only be "called" by telephone in case of need, but will do a good part of his business over the wires. The patient will be questioned as to his symptoms and condition by telephone, and will reply through the same medium; and directions can similarly be given to his friends or the nurse concerning the treatment to be pursued. If the sick man's pulse is to be felt, methods of connecting the microphone with the telephone can easily be devised, and the sphygmograph and other such instruments can be used and the results reported by the same means. If medicine is needed, the proper prescription can be "wired" to the apothecary, who will send it promptly to the patient's house. An entire campaign of treatment may be conducted without the doctor's once seeing the person, who may thus be cured — or killed — "at long range."

This reads at present like a joke, but, in all soberness, it may come to be more or less of a reality before many years have passed. A large part of a physician's dealings with his patients could be managed just as well by telephone as by personal attendance. In emergencies requiring his presence or labor in person, he would of course visit the patient; but a vast amount of time, trouble, and exposure would be saved him in the cases when this was not necessary. Who will venture to say that the telephone may not prove as much of a labor-saving and time-saving contrivance in medical practice as it already is in so many departments of business?

OZONE AS A PRESERVING AGENT.

We have received numerous inquiries in regard to the so-called ozone sold by the Prentiss Preserving Company (limited), in Cincinnati, and by their agents in this city. We need not inform our intelligent readers that ozone is not a solid substance, nor is it produced by the rapid combustion of sulphur or any similar body. The following analysis of the so-called ozone was made by Prof. R. B. Warder: —

Sulphur	93.67
Moisture and volatile oil	0.26
Fixed carbon	4.63
Loss and carbonaceous matter expelled at a red heat	1.35
Ash	0 09
	100.00

It is easy to see that the gas generated by its combustion consists chiefly of sulphurous acid gas, and while it is not what it pretends to be it possesses, to a certain extent, the valuable preservative qualities attributed to it. The price asked for it, $2 per pound, leaves a very wide margin for profit, as the sulphur, which is the active ingredient, can be bought for 2 cents per pound.

ANALYSIS OF BOSTON WATER.

Dr. Henry Leffman, of Philadelphia, a chemist of high repute, writes to the editor of the Journal as follows, under date of December 17, 1881: —

"An analysis of Boston city water was made in my laboratory recently, with the following results. One liter of the water yielded of

Free ammonia	0.01 milligram,
Albuminoid ammonia . . .	0.13 milligram,

equal to

Free ammonia	0.0014 grains,
Albuminoid ammonia . . .	0.0182 grains,

in each imperial gallon.

The amount of chlorine was quite low, as also the hardness, the latter being about 1.5°. The water had a distinct yellow color when received."

The presence of albuminoid ammonia would indicate sewage contamination. We have never found the amount of ammonia so high as has resulted from Dr. Leffman's examinations. It is probable that the water changes with the change of influences exerted upon it.

METEOROLOGY FOR DECEMBER, 1881, WITH REVIEW OF THE YEAR.

The sum of my observations on the weather for December is as follows: —

Average Thermometer.		Lowest.	Highest.	Range.
At 7 A. M.	32.26°	10°	60°	50°
At 2 P. M.	40.64°	23°	63°	40°
At 9 P. M.	35.22°	16°	56°	40°
Whole month . .	36.04°	10°	63°	53°
Last 18 Decembers .	26.27°	17.15° in 1867.	36.04° in 1881.	18.89°

The average barometer for the month was 29.025 inches, the lowest 29.15, on the morning of the 30th, and the highest 30.43, on the morning of the 12th and evening of the 16th, a range of 1.28 of an inch. The sum of the daily variations was 7.70 inches, or an average daily movement of .249 of an inch, exceeded during the past year in November and February only.

The face of the sky in 93 observations gave 39 fair, 19 cloudy, 19 overcast, 13 rainy, and 3 snowy. The amount of rain, including 1¼ inches of melted snow, was 5.93 inches; while the average amount for the past thirteen Decembers has been 3.55 inches, nearly. The least amount was .73 in 1875, the greatest 5.93 the past month, a range of 5.20 inches.

The prevailing direction of the wind approximately was west 10° 10′ south, or, in nautical phrase, west by south. The excess of southerly observations was 9, and of westerly 50, precisely the same as in 1874, and the only instances during the past thirteen years in which the December winds have had a prevailing southerly direction. Their average direction has been west 20° 5′ north, or W. N. W. nearly.

This prevailing southerly direction of the winds has doubtless had great influence on the temperature of the past month, giving us the warmest December for the past eighteen years, as seen by the above table, and nearly ten degrees above the average. The December of 1874, when the winds were similar, was 28.25°, only about two degrees above the average, showing that other causes besides the winds have also an influence on the temperature. In addition to this peculiarity of unusually high temperature, we may notice the almost entire absence of snow and the large amount of rain, the largest during the past thirteen Decembers. Several sudden changes occurred during the month, the most noted near the middle. The 10th averaged only 18°; the 14th, 56°, the warmest day in the month; and the 16th only 16°, the coldest day, — a remarkable swing of the pendulum in five days, the two coldest days embracing the warmest between them. Such changes are far from being conducive to health, unless special attention be given to corresponding change of raiment.

MONTHLY COMPARISONS OF TEMPERATURE FOR EIGHTEEN YEARS.

	1.	2.	3.	4.	5.	6.	7.	8.
	Daily.		Average.	Average.	Monthly.		Average.	
Month.	Lowest.	Highest.	1881.	18 Years.	Lowest.	Highest.	Below.	Above.
Jan.	-7°	48°	18.85°	22.70°	12.48°	32.98°	10.22°	10.28°
Feb.	-4	54	25.54	24.42	13.98	31.38	10.44	6.96
March	24	50	35.93	31.64	22.61	39.18	9.03	7.54
April	22	76	43.06	43.91	38.17	50.61	5.74	6.70
May	40	88	60.48	56.38	50.72	64.28	5.66	7.90
June	41	81	61.67	66.40	61.67	70.44	4.73	4.04
July	59	85	69.42	70.71	65.64	74.34	5.07	3.65
Aug.	55	88	70.48	68.32	62.79	71.76	5.53	3.44
Sept.	50	90	66.69	60.30	54.90	66.69	5.40	6.39
Oct.	28	84	53.25	48.75	40.60	56.16	5.15	7.41
Nov.	13	66	40.78	36.34	31.12	42.53	5.22	6.19
Dec.	10	63	36.04	26.27	17.15	36.04	9.12	9.77
Av.	27.6	72.3	48.52	46.34	39.32	53.03	7.02	6.69

In the above table columns 1 to 3 give the average temperature of each month, preceded by the extremes of the month, so arranged as to favor easy comparison of each month of last year with the average temperature of the corresponding month for the past eighteen years (column 4). It will thus be seen that last January, April, June, and July fell below the general average of those months, especially January and June, while the remaining eight months ranged above their average, especially December, giving the entire year a general average of more than two degrees above the eighteen years. It will also be seen that last August had an average above that of July, an event which occurs only once in four or five years, making the average July decidedly the warmest month in the year, as January is decidedly the coldest. These extremes are thus seen to occur in the month following that in which the solstice takes place, June and December.

Columns 5 and 6 show the coldest and warmest average of each calendar month in the year for eighteen years, and columns 7 and 8 show how much below and how much above the average these months have been; and here it will be noticed that the widest extremes generally occur in the colder seasons of the year. The footings of these columns are also interesting, especially those of the 5th and 6th. The footing of column 4 shows the average yearly temperature for eighteen years; column 5 shows what a year would be if made up of the twelve coldest calendar months, selected from the past eighteen years; and the footing of column 6 what a year would be if made up of the twelve warmest calendar months, either of which extremes would be highly injurious to vegetation, if not to health also, should such years occur in our region. But a kind Providence wonderfully overrules to shield us from these dangers, and although an occasional approach to these extremes often occurs for a single month may it not be to remind us of our dependence on and obligation to the Most High? D. W.

Natick, *January* 7, 1882.

ATOMS.

Another French physician, Dr. Clozel de Boyer, has died from diphtheria contracted in the course of his duties at the Paris Children's Hospital. — An Astronomical Congress is about to be held at Strassburg, which will be visited by many eminent astronomers from all parts of the civilized world; Strassburg was chosen because in its new observatory the best and most modern astronomical apparatus is to be found. — According to Professor Simony, the greatest depth of the Lake of Constance is 276 metres, that of Lake Leman 309 metres. — A ship canal across the peninsula of Maryland and Delaware, shortening the distance by water from Baltimore to the Atlantic, is an old project; but now it is to be speedily carried out, the necessary $8,000,000 having been raised. — *L'Electricité* states that M. Dohrn has introduced the telephone in connection with his scientific explorations of the bed of the Bay of Naples; by its use the diver and the boatmen overhead are able to communicate with each other quickly and intelligibly. — A Paris manufacturer claims to have discovered a process for substituting the leaves of the eucalyptus-tree, which in burning emit a delicious perfume, for tobacco leaves in making cigars. — A patent recently granted in Vienna and Berlin uses bands of steel, which is tempered and hardened, to transmit motion from one pulley to the other, the faces of the pulleys being turned perfectly flat, and then faced with a varnish of rosin, shellac, and asphalt. — Herr Krupp, the great German gun-maker, is so pressed with orders that he has engaged 8000 more workmen, making the total force of workmen 13,000. — R. P. Chittenden is inclined to the belief that in the stomach there are two stages of digestion, separate one from the other: a first, in which the action of the saliva can go on without hindrance; and a second, in which pepsin alone is active.

LITERARY NOTES.

Sewer Gas and its Dangers, by George Preston Brown, is published by Jansen, McClurg & Co., of Chicago. The author draws a hideous picture of the dire effects of sewer gas, nor is it a fancy sketch painted by the imagination, but the actual results of investigations made by him in the city of Chicago. The book will serve a useful purpose if it induces the public to exercise greater care in regard to house drainage. The evils of the ordinary system are pointed out, and a method given for finding and remedying defects. The author endorses the system devised by C. W. Durham, and adopted for the entire town of Pullman, near Chicago. Where this system has been introduced, according to our author, houses are absolutely free from sewer gas, and are likely to be so as long as the houses themselves shall stand. We hope that this latter statement may be true, and that we are to have a perfect system of house drainage at last.

We are indebted to H. C. Lea's Sons & Co. for *A Manual of Organic Materia Medica*, by John M. Maisch. The author is recognized as authority upon this subject, and the very thorough manner in which he has done the work makes it an invaluable aid to the student, the druggist, and the physician. Even the scientific botanist will be the better for having read its instructive pages and studied its excellent illustrations, which almost seem to speak. The author makes use of the metric system, but gives the commoner equivalent in parentheses, thus fitting it most perfectly to the present transition period.

The latest of Presley Blakiston's convenient "Handbooks for Students" is Smith & Marshall's *Chemical Analysis of the Urine*, based in part on Casselmann's *Analyse des Harns*, illustrated. This is the most complete and practical book of its size that we have seen on this subject, and will, in most cases, supply the place of larger and more costly works. We cheerfully recommend it to the chemical student as well as to the practicing physician.

Vick's Floral Guide for 1882 is one of the handsomest we have seen. Aside from its artistic merit and practical value, it almost deserves to rank as a text-book of botany, the illustrations being more copious and better than in many so-called hand-books of botany.

Dr. George G. Graff sends us his chart of the *Chemical Elements*. Only 67 elements are given, of which four are marked (?), namely, Barium, Chlorine, Zinc, and Murium. He includes Beryllium in the list of those that "have been announced, but their existence has not been authenticated."

The *New York Medical Abstract* completed its first volume, of 450 pages, with the December number. This valuable accession to medical literature does not give, as its name would imply, brief abstracts, but in most cases it copies the article in full. In addition to this, it gives the title of all the principal papers that appear in the various medical, surgical, and dental journals. It is published at 93 Fulton Street, N. Y.

The following pamphlets have been received: *An Apparatus for the Rapid Analysis of Mixtures of Gases*, by Arthur H. Elliott, Ph. B., F. C. S.; The *Rocky Mountain News Almanac*, 1882; *Annual Report of the Surgeon General, U. S. A.*, 1881; *How to use the Bromides*, by Geo. M. Beard, M. D.; *Catalogue of the State School of Mines*, Golden Col., 1881–2.

Medicine and Pharmacy.

THE FASTING CURE FOR CONSUMPTION.

BY C. E. PAGE, M. D.

It is a fact generally recognized by medical men of all schools that the only hope of cure in the disease known as *consumption* lies in the direction of improved nutrition. The chief reliance with all intelligent, educated physicians lies along the line of so nourishing the body with *food* that the tables shall be turned; so that, instead of waste exceeding repair, repair may exceed the waste, to the point of healing the diseased lungs and restoring the general health of the body. To this end both physicians and friends bend their energies; with what success may be judged from the fact that it is very generally believed that this disease, once fastened upon the human frame, is incurable. Am I rash in claiming this as a prevalent and well-nigh universal belief? From years of experience and observation I am led to think it true both that the disease is very rarely removed, in fact, and that, whatever may be said of the patients themselves, the friends and relatives almost invariably consider a fatal termination "only a question of time." Indeed, the hopefulness of the consumptive is set down, if not as an invariable symptom, at least as an accompaniment of the disease. The mortality reports, especially on the approach of winter, show that about one fifth of all deaths are from *consumption*, while if we add the deaths from inflammation of the lungs and bronchitis we find that diseases of the respiratory organs slay nearly, if not quite, one third of all! Boston's report, for example, for the week ending Saturday, November 27, 1881 is: consumption, 32; inflammation of the lungs, 17; bronchitis, 8; or 57 in a total of 152 deaths. The following week: consumption, 24; inflammation of the lungs, 22; bronchitis, 7; or 53 in a total of 182 deaths.

It has long been my own belief that consumption, instead of being caused *occasionally* by dyspepsia or disease of the stomach and bowels, and in such cases known as "bowel consumption," is in almost every instance due to (1) irritation of the respiratory organs, communicated from the inflamed stomach; and (2) indigestion and mal-assimilation of food, owing to inability on the part of the stomach and intestines — the chief blood-making organs — to perform their functions in a normal manner. In spite, or, as I am led to believe, *because*, of the excessive amount of food ingested, or because of its unnaturalness, in quality and preparation, or both combined, the overtaxed alimentary apparatus, in the cases we are considering, falls more and more behind in the performance of its functions, until, finally, consumption, a disease of slow starvation, is the result.

I believe it to be a fact of easy demonstration, although but little thought has heretofore been given to this point, that by far the greater proportion of cases of sore throat, "clergymen's sore throat" (called by a medical journal, recently, a "pious fraud"), and catarrh of the nasal mucous membrane, often ending in fatal lung disease, are due to irritation of the organs involved, extending reflexly from the stomach. Of the two sets of organs, the respiratory and the alimentary, while from lack of proper ventilation in our homes, churches, business offices, etc., the former are not, as a rule, fairly treated at all times (and even this is an injury to the body as a whole, not to the lungs merely), still it is the stomach, and through it the entire alimentary tract, that, from the involuntary cramming of infancy throughout life, is abused and outraged in such a manner that it is almost impossible to find a healthy stomach, if indeed one is ever found among people who live in the manner common to all classes in this country. Physicians do not hesitate to say that the dietetic habits of the people, including often their own, are such as virtually to prohibit health of the digestive organs. Witness the space devoted to the advertisement of innumerable quack nostrums. Our religious and secular newspapers, and even magazines of the first class, teem with them. Here we observe that the myriad symptoms of *dyspepsia* are the main reliance of the men who are coining money through the follies of their fellow creatures: acidity, flatulency, eructations of acrid matter (causing sore throat), heart-burn, constipation (causing blood-poisoning, piles, and an endless variety of disagreeable symptoms), — these are in part the penalties of making the proper nourishment of our bodies a secondary matter, if not the last thing considered, while the pleasures of the table absorb altogether too much of our attention.

It requires no stretch of the imagination, then, to consider that in *pulmonary consumption* the primary disease is in the stomach, and that the irritation of the lungs has its origin in and extends from the stomach by *continuity of tissue*, and that so long as the inflammation of this organ continues it is a constant feeder of the lung disease; and furthermore, that the decreasing power of the blood-making organs to perform their functions normally prevents the degree of nutrition necessary to heal the lungs, and put a stop to the emaciation or *consumption* of the body.

The question, then, is, What will most surely restore the diseased stomach and intestines, overtaxed and exhausted as they are, — continual work or temporary rest? If we essay to give them absolute rest for a time, in the hope of restoring them, will not our already starving patient sink rapidly and die, for want of the little nutriment now obtained from the gross amount ingested through our persistent efforts to "tempt the appetite," or excite it by stimulants, or to force upon an unwilling stomach food that, for want of digestion, must ferment and increase the irritation all along the line? The difficulty has been to furnish a test case, since, as a rule, neither patients, friends, nor attending physicians, for reasons readily understood, dare attempt the fasting cure in this disease.

I am very glad to be able to give the history of a case that, remarkable as it may seem to the profession in general, is to my mind remarkable only in that it was the result of the good sense and courage of the patient himself, in face of the protestations of physician and friends.

Terence Connolly, of Newton, N. J. Age, 70. Height, 5 feet 11 inches. "Weight in prime," 200 pounds. Enjoyed fair health until 1878, when he began to have a severe cough, and raised a great deal of "heavy stuff." By advice of a physician, who called his disease consumption of the lungs, he tried cod-liver oil. He received no benefit from its use, and gave it up. His cough grew worse; he continued to raise a great deal, and to decline in flesh and strength, until in the spring of 1881, his cough ceased, although he continued to have "a great burning in the lungs and stomach." From that time he failed more rapidly until on the 5th of July he was forced to take his bed and remain there. His appetite was poor; there was a "feeling of fulness at the stomach," rendering eating difficult; and he therefore resolved not to attempt eating until there should be a change for the better. He ceased eating on the 5th of July, when he took his bed. His bowels, habitually constipated, seldom moved except by the use of purgative medicines, which he now abandoned.

He took water freely throughout the fast. For the first 21 days there was no movement of the bowels. Then "a diarrhœa set in, and continued furious for 20 days," when it ceased for a time; again a few days of diarrhœa, and then a closed state for quite a while. On the forty-fourth day, having fasted absolutely for 43 days, he began taking beef-tea, drinking it whenever thirsty. He took a little brandy and water occasionally. He continued using the beef-tea, all the while growing more and more emaciated, for about one month. Bowels remained closed from August 19th until about September 1st (this was during the administration of the beef-tea), when there were "very rapid movements" for three days; discharges were like "clotted blood or liver." Following this there were no movements until September 20th, when, for the first time, acting upon my advice, he abandoned the beef and brandy, and began a system of diet which, in my opinion, should have been instituted as early as the nominal ending of the fast, namely, on the 44th day, and, very likely, even earlier. This is what is known as the bread and fruit diet, and embraces a great variety of breads, mushes, and fruits of all kinds. Mr. Connolly chose to eat oat-meal mush, chiefly, and raw apples both of which he relished very much. This was on September 20th, after 76 days' abstinence from solid food, the last 33 of which, on beef slops, was, in my estimation, but little better than a continuation of the fast. Shortly after his resumption of solid food his bowels resumed their excretory function, and have since been perfectly regular in their action. Although, as we shall see, he was now in reality making good progress, still, for some time, his friends could see but little gain.

October 7, 1881 (after seventeen days of "fruit diet"), a letter from his brother to me says: "Still alive, eating a little every day with a relish, but as yet gains no strength, and does not expect to. He is terribly emaciated; his feet and ankles have been swelling badly for some months; his pulse is sometimes regular, at others irregular. He takes no medicine of any kind, and will not take any. We fear he will get sore in bed, but does not as yet."

Twelve days later, October 19th: "You will be surprised to hear that Mr. C. is up an hour or two, or more, every day. We believe his long fast has extended his life and saved him a great deal of suffering too. He continues the oat-meal and fruit regularly, and sometimes takes a little toast, a fresh egg, etc. To-day he walked up-stairs unaided, to find such an apple as he wanted, came down, ate his apple, and then, for the first time since last June, walked out in his garden. His feet continue to swell some, and he does not gain strength very fast." (In reality he was going on very satisfactorily, as we shall soon see.)

November 24th: "I am glad to be able to tell you that Mr. C. is nearly as well as ever. Strength, of course, not fully restored, — we cannot expect that at his age, — but, all things considered, he is first rate. He is up every day. Vacated the sick-room ten days ago; appetite good; sleeps well; out in the garden last week, raking up leaves, and this morning he was out shovelling snow. Carries in coal from the coal-house, etc. He is the wonder of the place and of the doctors, too."

November 29th: "Gaining every day. He is as strong now as before he was taken down, and as heavy; weighs 150 pounds. His lungs are still a little sore, but there is no cough. This is a good report."

My attention was first called to this case by a paragraph in the papers, which stated the main facts, but without giving the name; simply saying that "a man in Newton, N. J., had abstained from food for the space of 43 days, in the hope of curing consumption, with which he was afflicted," etc. I addressed a letter of inquiry to the postmaster of Newton, who replied that the statement as printed was substantially correct, and named Mr. James English, a

brother-in-law of the patient, as one who "knew all about the case, and who would tell me nothing but the truth." I have since then been in close correspondence with Mr. English. Upon receiving from him a full account of the fast, I wrote, urging the abandonment of the beef-tea, and the adoption of the bread and fruit diet. The change was at once made, although with little expectation on the part of patient or friends that much benefit would result therefrom, and least of all that restoration to health would follow.

As we have seen, the case has terminated in a radical cure. The moral to be drawn from it is this: In all cases of progressive emaciation, that is to say, where the organs of digestion and assimilation have become so impaired that the body is not nourished, but is steadily declining, the attending physician should consider the question of absolute rest for the alimentary organs, so far as the ingestion of food is concerned. The presence even of a craving appetite should be regarded as a morbid symptom, and should weigh in favor of abstinence. It should be borne in mind that the earlier this remedy is applied the smaller will be the "dose" indicated, and the more speedy and complete the relief.

Had Mr. Connolly, for example, changed his manner of living five years sooner from three "mixed" meals, with the usual condiments, including hot, stimulating drinks, as tea, coffee, etc., to two, composed of the cereals, vegetables, and fruits, prepared in the simplest and plainest way, a most valuable lesson would have been lost to us: there would have been no occasion for the fast here recorded. I have means of knowing of over five thousand families in this country alone who have made this change for preventive and curative purposes, and with the happiest results. Again, if, at any time during Mr. Connolly's first year of "pressure in the region of the stomach and lungs, accompanied by severe cough and raising," he had fasted for the space of three or four days, or a week, perhaps, by the advice and under the care of an intelligent physician, who could judge of his needs in this direction, and had he thereafter lived on the plain diet which he now finds so complete, he would have escaped severe illness, and in all probability would have enjoyed uninterrupted health to the present hour.

Any person who finds his appetite failing or fitful — sometimes "poor," sometimes "craving" — has continued eating too long; and the sooner he stops, the less danger he will incur. The most pernicious custom of which I have any knowledge, yet one almost universal in the case of the sick, is that of "tempting the appetite," concocting fancy or especially toothsome dishes, when nature is saying in the plainest manner that feeding has already been overdone. It is like bribing an exhausted laborer, who can scarcely move a muscle, to rouse himself to fresh tasks; he will do more and better work by reason of present and absolute rest. And the same is true of the sick stomach: there will be a relish for the coarsest article of diet — aye, it will be delicious — when the digestive organs shall have been sufficiently restored by rest. It is very unfortunate, for many reasons, that this case was not conducted from the start under the watchful care of a regular physician, in full sympathy with and having the entire confidence of the patient and his family. It is not unlikely that the period of fasting might have been shortened to some slight degree; and at any rate the month of beef-tea stimulation might well have been saved. One moderate meal a day of pure food, during this period, would have been better borne, and would have furnished sufficient nourishment to have set the patient far on the road to health. The experiments of Tanner in New York, Griscomb in Chicago, and now of Connolly in Newton, N. J., have, I believe, demonstrated the fact that, in health or in sickness, in all cases of abstinence from all food save water and pure air, of whatever disease the subject may die, *it will not be of starvation, so long as there remains any considerable amount of flesh on his bones.* By the light of recent experiences we shall do well to study more closely the functions of the lymphatic system. Human flesh, by absorption, constitutes a most appropriate diet in certain conditions of disease. The absorption and excretion of diseased tissues is, under some circumstances, the only work that nature can undertake with safety, and in such cases no building up can be successfully accomplished until a solid foundation is reached and the *débris* removed.

PREPARATION OF PEPTONES.

Brandy and beef-tea were formerly the chief reliance of the nurse who had to sustain the patient in some great crisis of disease, but other substances, less stimulating and more nourishing, are now added. Among the most recent accessions to this list is the digested food, or *peptones*, used with such good effect in the case of the late President Garfield.

The following method for their preparation is given by M. Petit, of Antwerp: One pound of beef deprived of fat and tendons is chopped very fine, and digested for twelve hours at a temperature of 122° F. in 5 quarts of water containing 0.4 per cent. of pure hydrochloric acid. The mixture is frequently stirred. A quantity of pepsine is added, depending on its strength. Generally speaking, 1 part, by weight, of pepsine from the stomach of a hog is sufficient for 100 parts of beef. At the expiration of 12 hours the product is passed through linen, and after cooling is filtered through a wet filter to separate the grease. The filtrate should be free from albumen, as shown by its yielding no precipitate with nitric acid. It is then carefully neutralized with bicarbonate of soda, and evaporated to 25° B. on a water-bath, or to complete dryness.

Peptones prepared in this way can be given in beef-tea or soup, but if it is desired to mix them with wines or syrups, tartaric acid is employed instead of hydrochloric acid; he then saturates one half of the liquid with bicarbonate of potash, and adds the other half when the acid tartrate is formed and precipitated.

VACCINATION AS A SPECIALTY.

Dr. S. Baruch, in "A Plea for Improved Vaccination," which appeared in the *New York Medical Record* for January 7, 1882, calls attention to "the neglect of Jenner's teachings" in our day, and shows that the imperfect protection which vaccination often affords against small-pox is not due to deterioration of the "virus," as has been supposed, but rather to lack of proper care in selecting and using it. He is not disposed to enter the lists against the advocates of bovine virus, which, as he says, "is extremely useful for preservation and transportation, and affords good protection when genuine and carefully guarded and inoculated," but he nevertheless holds that "the good old Jennerian plan of arm-to-arm vaccination should be resorted to whenever practicable."

The remedies for the existing imperfect protection against small-pox are, he believes, to be found: —

(1.) In renewed attention to the selection of proper eighth-day lymph, more careful cultivation of bovine "virus," greater care in both cases to scrutinizing and tracing it to a pure source. Each supply should be tested on one healthy vaccinee before it is extensively inoculated. Especially is this precaution needed in the use of bovine "virus," which not rarely produces local irritation, whose effect is pernicious upon the protective influence afforded by it.

(2.) Too much attention cannot be given to the methods of vaccination now in vogue, — the technique of this simple procedure. Those who are not familiar with the writings upon this subject by Marson and Seaton would do well to study their valuable suggestions and elaborate directions, especially with reference to the watchfulness necessary when the vesicle is maturing or matured. The care, precision, and attentive regard for minutiæ which the men of Jenner's day and the time immediately succeeding bestowed upon this seemingly trivial work may be profitably emulated by the present generation of medical men, if they would protect their fellow-men against the terrible scourge which now and then invades our cities and populous country districts.

(3.) A more thorough instruction of medical students in the details of obtaining supplies of vaccine material, in the methods of its propagation, in the technique of vaccination, in the diagnosis of the true from the spurious vaccine vesicle, is imperatively demanded. The medical student cannot be too deeply impressed with the idea that this operation, slight as it may seem, will confer greater benefits to the people under his care than all the skill he may acquire in surgery. . . . No medical student should be allowed to graduate who does not exhibit a full appreciation of the importance of vaccination and a thorough knowledge of all its details.

Finally, Dr. Baruch offers the suggestion that vaccination be made a new "specialty." The idea seems to us an excellent one. The "vaccinator" in our large cities would probably be far more useful to the public than many of the present "specialists," and the general practitioner would be relieved of what is now a troublesome and unremunerative portion of his duties. One who devoted himself exclusively to vaccination could afford to give a minute care and attention to all the details of the operation which are not to be expected of physicians burdened with a large and varied practice. Making it a specialty would also lead to improvements. The specialist has the advantage of a limited field of observation and study, with an immense number of "cases" in that field. If he makes the most of his opportunities, he cannot fail to become an "expert," if not a discoverer and a reformer.

SPIRIT OF NITROUS ETHER.

Dr. Cottel, of Braidwood, Ill., writes to the *Louisville Medical News* of November to say that old or inferior sweet spirit of nitre *will* dissolve quinia sulphate, but that the fresh and pure article *will not.* He remarks as follows: —

Spiritus nitri dulcis, as prepared by the present U. S. process (which was modelled after the plan of Dr. Squibb), should contain no excess of acid, and is almost neutral in its reaction. With age it becomes strongly acid, and it is then pronounced unfit for use by authorities on the subject.

Old and inferior nitre will dissolve quinia sulphate readily, but a chemically pure article will not. I have now a specimen of sweet spirit of nitre, manufactured by Billings, Clapp & Co., of Boston, which

will not dissolve two grains to the ounce, though I have had them mixed in a tightly-corked vial for several days. The addition of a few drops of almost any acid would at once overcome this difficulty. I fear that the specimen of nitre used in Dr. Kenner's experiment was either old or of inferior quality, or the results would not have been so satisfactory.

SELECT FORMULÆ.

COURT PLASTER. — The following is the process recommended by the Committee on Revision of the United States Pharmacopœia. Take of

Gelatine	1 part.
Tincture of benzoin, a sufficient quantity.	
Water	12 parts.
Taffeta (silk), a sufficient quantity.	

Dissolve the gelatine in the water. Spread a piece of taffeta (silk) on a level surface, and coat it with a layer of tincture of benzoin. When this is dry reverse the taffeta, and apply to the other side the gelatine solution in five or six successive layers, waiting after each application until the layer is dry.

ISINGLASS PLASTER. — This formula is from the report of the same committee. Take of

Isinglass	10 parts.
Alcohol	40 parts.
Glycerine	1 part.
Water, a sufficient quantity.	
Tincture of benzoin and taffeta, of each a sufficient quantity.	

Dissolve the isinglass in sufficient hot water to make the solution weigh 120 parts. Spread one half of this upon the taffeta stretched on a level surface, in successive layers, waiting after each application until the layer is dry. Mix the second half of the isinglass solution with the alcohol and glycerine, and apply it in the same manner. Then reverse the taffeta, and coat it on the back with a layer of tincture of benzoin. Finally dry it. Substituting gram (15.5 grains) for part, the above quantities are sufficient to cover a piece of taffeta 42 centimetres long (16½ inches) by 35 (13¾ inches) wide.

SPIRITUS ODORATUS. — The London *Chemist and Druggist* gives the following as a cologne water proposed for the Pharmacopœia: —

Oil lavender flowers	½ oz.
Oil rosemary	¼ oz.
Oil neroli petitgrain	1½ oz.
Oil neroli bigarade	1½ oz.
Oil lemon-peel	1½ oz.
Oil orange	2½ oz.
Oil bergamot	2½ oz.
Oil rose geranium	½ oz.
Tincture styrax	2 oz.

To the above (all by weight) add

Deodorized alcohol	26 pints.
Orange-flower water	6 pints. M.

TREATMENT OF BURNS. — The journal of the Austrian Apothecaries' Society says that if the burned part be dipped in water, and then painted with a camel-hair pencil with essence of peppermint, the pain will be instantly relieved, and no scar will be formed.

MEXICAN MUSTANG LINIMENT. — This is said to consist of petroleum, ammonia, and brandy in the following proportions: —

Petroleum	1 quart.
Water of ammonia	1 pint.
Brandy	1 pint.

PASTE. — A correspondent of *New Remedies* gives the following recipe for a paste for use in prescription books and labels: —

"I dissolve half an ounce of alum in a pint of boiling water; to this I add an equal weight of flour, made smooth in a little cold water, and a few drops of oil of cloves, letting the whole come to a boil. This paste will keep months. I put it in ass or ordinary ointment jars. It is handy, too, domestic purposes."

MISCELLANEA AND FACETIÆ.

A FRENCH PATENT-MEDICINE HOUSE. — The great Paris business of medical specialties, formerly known as "Maison Frère," and for some years past the property of M. Ch. Torchon, who recently died, was sold by auction December 2d, and, after an active competition was bought by M. Torchon's widow for 10,500,000 f. ($2,100,000.) The representative of an English company bid up to 9,000,000 f., but then retired from the competition. This house is the owner of Belloc's charcoal, Clertan's perles, and many other well-known French specialties.

GOOD ADVICE TO ANTI-VIVISECTIONISTS. — A committee of the Medical Society of the State of New York have addressed to the officers and members of the American Society for the Prevention of Cruelty to Animals a letter, the main paragraph of which reads as follows: —

With you we earnestly desire to prevent every form of unnecessary suffering. But we would most strongly draw your attention to the radical difference between the infliction of wanton cruelty and the serious and careful use of the lower animals for the benefit of humanity and the brute creation; and we respectfully ask that the name and authority of your society may not be employed to the injury of the medical profession and of medical science.

MRS. ERNEST HART. — At the Paris Academy of Medicine Dr. Noel Gueneau de Mussy recently presented and summarized two papers, which were, he said, specially interesting as being the work of an English lady, who had carried on her medical studies with distinction in the University of Paris, — Mrs. Ernest Hart, the wife of the able editor of the *British Medical Journal*. The papers were on the number, size, and color of the blood corpuscles in health and disease, and the symptomalogical value of the indications to be derived from this method of observation. Professor Gueneau de Mussy highly eulogized the matter and critical method of these papers, as showing a true scientific spirit. Mrs. Hart was a student at the Bloomsbury School of Pharmacy a few years ago.

A DENTAL TRIUMPH. — At a recent meeting of the Medical Society at Strasburg, Dr. Jules Boeckle presented, in the name of M. Sauval, dentist, a lady from whom the latter had extracted a small molar tooth for dental caries, with violent pain; and, having found it slightly carious to the bottom of its root, he sawed off the points of the root, filled it with gold carefully throughout the carious channel, and then reimplanted the tooth. The lady was free from all her pain; the tooth reëstablished itself solidly in the mouth; and at the date at which she appeared at the society (three weeks after the operation) the tooth served for mastication as well as her other teeth.

GETTING ONE'S MONEY'S WORTH. — Sir William Fergusson, after a successful operation on a Manchester millionaire, was asked by the patient to name the fee. "Two hundred guineas," was the reply. "Two hundred guineas!" exclaimed the patient. "Yes," said Sir William. "You forget the life-long experience required to give the proper skill, the time and toil of the journey, and the loss of practice in London." "But you have been only ten minutes about it," said old Dives. "Oh, if that's your only objection," said Sir William, in his broad Scotch, "the next time I come I'll keep ye an 'oor under the knife."

MODERN SCIENCE AND MIRACLES. — The Paris *Evenement* reports a conversation between a couple of sages of the most modern pattern. One mentioned the resurrection of Lazarus. "The dead never rise from their tombs nowadays," said he. "No," answered the other naïvely; "medicine has made too much progress for that."

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GOOD WORDS FROM SUBSCRIBERS.

RUSHVILLE, IND., *January*, 1882.

TO THE JOURNAL.

My wife and children find a great deal of interesting and valuable reading in the Journal, as well as myself, so we think we cannot drop it from our list.

LAKE CITY, MINN., *December* 28, 1881.

BOSTON JOURNAL OF CHEMISTRY CO.

Gents: I have taken your paper from the first volume, and have nearly all the numbers now. Have some of the volumes bound. Almost any number of it contains some one article which I deem well worth the subscription price. I frequently get some of the articles in the Journal copied into our local paper, especially those on adulterations of food and those on poisons and on dangerous practices.

Yours truly, D. K. BOUTELLE.

BALLSTON, N. Y., *December* 28, 1881.

JOURNAL OF CHEMISTRY.

I have taken your valuable paper since its first issue, and shall continue it to *its end* or *my own*.

Yours, etc., L. MOORE, M. D.

NEW SALEM, *December* 28, 1881.

JOURNAL OF CHEMISTRY.

I enclose $2.00 for the Boston Journal of Chemistry, from January, 1881, to December, 1882, inclusive. I like the paper; it is filled with solid common sense and wisdom.

DR. GEORGE PEIRCE.

NASHVILLE, TENN., *December* 26, 1881.

Please find enclosed one dollar for the Journal of Chemistry. I cannot do without your valuable journal.

CHARLES ROBERTSON.

Boston Journal of Chemistry
AND
POPULAR SCIENCE REVIEW.

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Familiar Science.

STANDARD TIME FOR THE UNITED STATES.

BY PROF. C. A. YOUNG.

As railroads and telegraphs multiply, the desirableness of some recognized time-standard makes itself more and more keenly felt. At present we have in the country over seventy "railroad-times," and in each of several of our cities there as many as four. On any extended line the continual change of time is an annoyance to the traveller, and an embarrassment to the management of the business; in some cases, it has been the occasion of disastrous accidents. It is clear that if a uniform standard could be established throughout the country a great advantage would be gained. Would there be countervailing disadvantages, and if so can they be avoided by any slight modification of the standard system?

It must be admitted that while a single time-standard answers perfectly for an area no larger than England and Scotland, it would be very inconvenient in the United States, which extends over more than three hours of longitude.

Whether we choose or not, the sun will always regulate our life: we shall rise in the morning, and retire at evening; work in the day, and sleep in the night; and any system of reckoning time which ignores this will be difficult to introduce, and unsatisfactory in practice. If, for instance, Washington time were made the standard for the country, noon at San Francisco would come about three P. M., by the watch, and the people there would have to forget all their accustomed time relations, and learn new ones. Probably, after a time, they might become used to the new order of things; but whenever one travels, or changes residence, the same process must be gone through with again, in every new place.

The late Professor Peirce, however, advocated a plan which, retaining the most important advantages of the single time-standard, measurably avoids its worst difficulties. He proposed to recognize in the United States *four* time-standards, differing from each other by entire hours, but agreeing precisely in minutes and seconds. They might be designated as Atlantic, Mississippi, Mountain, and Pacific times, the last being just three hours slower than the first. In this way no place would have to use a time differing more than half an hour from its own true local time. As we now have at certain seasons of the year a difference, hardly noticed, of over fifteen minutes between sun-dial time and clock time, it is probable that a difference even twice as great would not be found intolerable. At the same time telegraphic signals from the standard clock would be immediately available everywhere, since the minutes and seconds would be correctly indicated, and the difference of one or more whole hours could never cause any confusion.

As to the time which should be taken for the standard of the minutes and seconds, it must almost inevitably be either that of Washington or Greenwich. If we consult national pride, Washington time would naturally be chosen; if we look simply to general convenience, Greenwich time will carry the day. For landsmen, the only advantage of Greenwich time is that the meridian of five hours (which would be the Atlantic time standard) passes between New York and Philadelphia, not so far west but that the whole State of Maine lies within half an hour of it. The Washington meridian lies about eight minutes farther west. This, however, is a matter of very small account. But with sailors the case is different; in navigation, almost all nations, except the French, now reckon from the meridian of Greenwich, and signals in the principal ports giving Greenwich time would suit their convenience (in rating their chronometers) much better than Washington time.

If, then, we assume Greenwich time as the standard, Atlantic time would, as has been said, lie between New York and Philadelphia times; Mississippi time would be that of a meridian between Chicago and St. Louis; the meridian of Mountain time would pass very near Denver, and that of Pacific time near San Francisco. Probably in most cases each State would prefer to have but one time used throughout its limits, so that those States through which would pass the natural boundary between two of the time-systems would elect one or the other by legal enactment: Ohio, for instance, which is nearly bisected by the meridian of five and one half hours from Greenwich.

The establishment of this system need not be difficult or long delayed. The Signal Service proposes to receive time from certain widely distant observatories, and then to transmit it daily to all important places, dropping time-balls (on Greenwich time) at all the ports. The object in getting their time from several observatories is to avoid as much as possible the effect of cloudy weather. We have at present several time services, of greater or less extent and accuracy. In New York there are received four distinct sets of signals, — from Washington, from Allegheny, from Albany, and from New Haven; occasionally also, we believe, from Cambridge. Now, it is no unusual thing for these to differ from each other by one second; and sometimes the difference is two, or even three seconds, when the weather has been bad for several days at some of the stations, because no clock can be trusted any length of time unchecked by the stars.

If the Signal Service is enabled to carry out its plan, and if the railroad, steamboat, and telegraph companies will adopt its standard exclusively in all their business, the general public will follow, and the reform will be accomplished almost without notice. The principal opposition is likely to come from the observatories which have gone into the business of time-distribution, and now make it a source of revenue. If, however, the Signal Service will employ these institutions to make its time determinations, and pay them for their work, as would be only fair, they might perhaps be brought to coöperate in the matter.

There is no reason, in this day of telegraphs, why every railroad clock in the country (and in the world even) should not show the correct Greenwich time within a fraction of a second, and thus put an end to all the present confusion.

AUGUST WILHELM HOFMANN.

IN the scientific world a man is judged by his works, and the names of those who have contributed to the sum of human knowledge and extended the boundaries of science by their researches will be known and honored long after the name of the ruling sovereign has passed into oblivion. The names of such men as Hofmann, Bunsen, Bäyer, Wurtz, and others of to-day, like those of Liebig and Berzelius in the past, will live as long as chemistry shall be known and honored as a science.

The subject of our sketch, although a German by birth, is more cosmopolitan than most of his colleagues. Frequent and extensive travelling on the Continent and a residence of fourteen years in the English capital have contributed to this. In fact, it may be doubted whether his researches would have taken so practical a turn and his results have been of such commercial value but for his long residence in England, where many of his most brilliant discoveries were made.

Professor Hofmann was born in Giessen, April 8, 1818, and was a son of the architect who de-

signed Liebig's new laboratory. This incident changed the whole course of his life; for, instead of devoting himself to the modern languages, as he had intended to do, he was persuaded by Liebig to turn his attention to chemistry, and became his assistant. He remained in that position until 1845, when he was appointed professor extraordinary at Bonn. He soon relinquished that position to accept the direction of the laboratory in the newly established Royal College of Chemistry in London. Here he won an enviable rep-

utation as one of the most successful teachers of chemistry of the present day. A writer in "Knight's Cyclopædia of Biography" says of him at this time: "Although Doctor Hofmann is a foreigner, he has so far succeeded in mastering the difficulties of our language as to be a fluent and highly popular lecturer on chemistry." The text of the lectures delivered in London, or part of them, was published by him in London in 1865, under the title of an "Introduction to Modern Chemistry." They have since been translated into German, and passed through six successive editions. A glance at the original English edition will show his remarkable familiarity with the English tongue. His style is easy and graceful, and he leads the reader by a series of interesting experiments up to the fundamental laws of chemistry. His lectures are so unlike those of most other teachers as to possess a sort of fascination for the hearer. The apparatus which he devised for illustrating his lectures is now extensively used, and still more widely known, under the name of the Hofmann apparatus.

During his residence in England he held for several years the position of chemist to the Mint; served on the jury in the industrial exhibitions; was frequently called upon to act as scientific expert; delivered workingmen's lectures, which were well attended, and also several courses of lectures at the Royal Institution of Great Britain, with eminent success. He examined the water of London, and, with Professor Graham, made an investigation of the bitter ales at a time when a suspicion had arisen that they were adulterated with strychnine. In 1851 he was made a Fellow of the Royal Society, and in 1861 elected president of the London Chemical Society.

Professor Hofmann left England in 1862 to organize the chemical laboratory at Bonn, and the large and convenient building now occupied by Professor Kekulé and his assistants was designed by Hofmann. He did not, however, remain to see it finished, having been called the following year to succeed Professor Mitscherlich at Berlin. Here, too, he had the task of erecting and furnishing a new laboratory.

In 1868 he founded the German Chemical Society in Berlin, which now numbers over two thousand members; and its Proceedings for each year fill two volumes of over 1000 pages each. For some time he held the position of president, and in the capacity of vice-president he usually presides at its meetings, unless prevented by illness.

To his scientific investigations we can do but imperfect justice in the limited space at our command. It is in connection with the aniline colors that he has won a world-wide reputation; but reputation has been his only reward, for he has taken out but a single patent, long since expired, upon any of his numerous and valuable discoveries.

In 1843, while still at Giessen, he published the results of his investigation of the bases in coal-tar, a subject in which he has ever since taken the deepest interest. Runge, ten years before, had announced the discovery of six substances in coal-tar. Two of these, to which he gave the names of kyanol and leucol, are bases, and occur in the heavy oil of coal-tar (now called dead oil). These were the objects of young Hofmann's first research. Starting with half a ton of coal-tar, he succeeded in obtaining about four pounds of the crude bases, kyanol and leucol. Having carefully separated the two, he proceeded to purify the former, and study its chemical, physical, and physiological properties. Upon comparing it with other organic bases, he found that it was identical with *benzidam*, which Zinin had obtained by the action of reducing agents upon nitro-benzol, and also with the substance obtained by Unverdorben, in 1826, by distilling indigo. These three bases, which Hofmann proved to be identical, are now all known under the general name of aniline, from *anil* = indigo. The other base, leucol, or leucoline, has since been made synthetically, and is beginning to attract some attention under the name of *chinoline*, as a substitute for quinine, and is often spoken of as artificial quinine.

In 1856 Perkin made the first aniline dye, which he called mauvine. Fuchsine, or aniline red, was discovered at different times, independently, by different persons. It is said that Hofmann noticed it as early as 1843; but in 1858 he devised a method for its manufacture from aniline and chloride of carbon, which proved successful on a manufacturing scale. At this time it was known as Hofmann's red. Upon a careful investigation of the red dye, then called magenta, solferino, fuchsine, etc, he discovered that it was a salt of a colorless organic base ($C_{20}H_{19}N_3$), to which he gave the name of *rosaniline*. By reduction with zinc he converted this base into leucaniline. A similar investigation of aniline blue, or "bleu de Lyon," showed that it was a phenyl derivative of rosaniline, to which he gave the name of triphenylrosaniline. The aniline dyes being thus placed upon a scientific basis, it was no longer a matter of conjecture how to produce a given shade. He next proceeded to make a series of purples by the substitution of methyl, ethyl, and amyl radicals in rosaniline. This series of dyes, which even surpass the famous Tyrian purple, was patented by him May 22, 1863, and are always known in commerce as the Hofmann violets. Another of his discoveries, that has been of practical and commercial value, was that pure aniline would not yield a dye, as would the crude oil, which contains its homologue, toluidine.

Although best known for his researches upon dyestuffs made from coal-tar, he has made important contributions to other departments of organic chemistry. In 1848 Wurtz made the first organic ammonia, or amine, by distilling cyanic ethers with potassic hydrate; the following year Hofmann produced the same bodies by an entirely different method, using ammonia and the iodide of an alcohol radical. In 1850 he prepared trimethylamine by the method above indicated, and the following year he discovered the same substance in herring-pickle. It has since been improperly called propylamine, with which substance it is isomeric. In 1854 a royal medal was awarded to him for his memoirs on the molecular constitution of the organic bases. His work on phosphorous bases, phosphines, and polyamines has contributed much to our knowledge of these subjects, while his investigations of the mustard oils have been of even greater importance. He also devised new methods for the separation of arsenic from antimony, and of cadmium from copper, and investigated the manufacture of paper-parchment. As an indication of his activity and industry, we may note the fact that the first twenty-five yearly volumes of the "Journal of the London Chemical Society" contain more than ninety original papers by Doctor Hofmann; and within the last thirteen years he has found time, although continually employed in teaching, to contribute one hundred and seventy original papers to the "Proceedings of the German Chemical Society." Although this work is not all done with his own hands, his head plans and directs it. He has at all times five or six assistants busy on his investigations, whose labors he closely watches and controls. A recent number of *Nature* contains a very pleasantly written biography of the great French chemist, Jean Baptiste André Dumas, from the pen of Professor Hofmann. It shows to the English reader not only a peculiar familiarity with our tongue, but a remarkable power of description, which would have gained for the author a high position in the literary world, had he chosen that for his field.

Notwithstanding his numerous and valuable scientific labors, he has always found time to cultivate the social amenities, and enjoys gathering about his festive board the young and lively, as well as the old and sedate. Unlike most Germans, he despises tobacco in all its forms, and even prefers wine to beer. He is fond of society; enjoys good music; and is a general favorite, even at court. Unlike Virchow and Paul Bert, he takes no active part in politics; but the crowned heads of Germany may sometimes be seen in his lecture-room, and he often delivers chemical lectures in the royal palace to select audiences.

As a teacher he is very popular; his large auditorium is always crowded. His energetic tone and enthusiastic manner in the lecture-room

make the dullest subjects interesting. In the laboratory he is continually spurring the student on to fresh activity, and demands that at each daily visit he shall find some fresh difficulty overcome, some point gained, or some new step taken. Those who are disheartened by failures are encouraged by his maxim that "to the gods and the chemists all things are possible." Loafing is not so easy here as in too many a German laboratory, where time is estimated by its German value.

Although in his sixty-fourth year, Professor Hofmann is remarkably vigorous and active, and at present holds the office of Rector in the Friedrich-Wilhelm's University at Berlin.

EXPERIMENTS FOR YOUNG CHEMISTS.

BY PROF. E. J. HALLOCK, PH. D.

VI.

CHLORINE.

THERE are several methods of preparing chlorine gas, Cl, but the most certain and convenient is by the action of manganese dioxide upon hydrochloric acid; $4\,HCl + MnO_2 = MnCl_2 + 2\,H_2O + 2\,Cl$. Introduce 2 grams of manganese dioxide into a large test tube, and pour upon it 5 cc. of hydrochloric acid; then insert the cork and allow the delivery tube to extend to the bottom of a dry, empty bottle, as seen in Figure 9.

Fig. 9. Preparation of Chlorine.

Chlorine is a very heavy gas, having a specific gravity of 35.5; hence it is collected by downward displacement. The bottle may be covered with a piece of card-board. At first some gas is given off, but it soon becomes necessary to warm the test tube gently. Chlorine has a greenish color, and in the day-time it is easy to see when the bottle is full, but at night the color is not so readily noticed. The gas has a bad smell, and care must be taken not to inhale it. Fill two or three bottles with the gas, and cover them with pieces of greased glass.

Moisten a strip of pink cambric, and hang one end in the bottle of chlorine; also a strip of litmus paper; the color will soon be destroyed. Chlorine bleaches vegetable colors. Black ink is destroyed, but lead-pencil writing is not. Bring a lighted candle slowly into a bottle of chlorine; it begins to smoke, and finally is extinguished. The candle contains carbon and hydrogen; the latter unites with the chlorine, setting free the former as soot or smoke, as seen on the right of Figure 10. It will also be noticed that the candle flame has a green border. Let a J-shaped glass tube be connected with a hydrogen generator, and after the air has been expelled wrap the bottle in a towel and ignite the gas. On bringing the hydrogen jet into a jar of chlorine white fumes will be formed (see Figure 10); but if illuminating gas be burned in chlorine a smoky flame will result, because carbon is set free.

Pass chlorine gas into water as long as any of it is absorbed, and preserve the solution, known

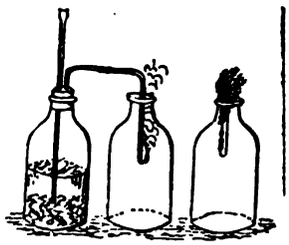

Fig. 10. Experiments with Chlorine.

as chlorine water, in a glass-stoppered bottle covered with black paper, for future use.

HYDROCHLORIC ACID.

When hydrogen is burned in chlorine, as in the above experiment, it unites with the chlorine and forms hydrochloric acid gas: $H + Cl = HCl$. It is best made by pouring sulphuric acid upon dry common salt, NaCl. The reaction is as follows: $NaCl + H_2SO_4 = HCl + NaHSO_4$. To prevent foaming, the salt may be previously melted on an iron plate. Hydrochloric acid gas is very soluble in water, and must also be collected by displacement, as shown in Figure 9. It is colorless, but is easily detected by its action on moistened blue litmus paper. It extinguishes a flame, and gives dense white fumes when a rod moistened with ammonia is brought near it. Having filled one bottle completely with this gas, invert it over water; in a short time the water will rise to take the place of the gas that has been absorbed. A solution of this gas in water forms the ordinary commercial hydrochloric or muriatic acid.

Test for Chlorides. Put one drop of hydrochloric acid in a test tube full of pure water, and add a little nitric acid, then a few drops of a solution of silver nitrate; a white precipitate of silver chloride is formed, which soon settles if violently shaken. It blackens in sunlight, and dissolves in strong ammonia. All soluble chlorides do the same. The experiment should be repeated with a solution of common salt, another of ammonium chloride, and with any other chloride. A solution of any lead salt may be substituted for that of silver, but the test is not so delicate; lead chloride dissolves in boiling water.

Test for Bromides. Bromides act very much like chlorides, but the silver salt has a yellowish color. Add to the solution of potassium bromide some chlorine water and chloroform or carbon disulphide. On shaking, the mixture acquires a yellow color.

Test for Iodides. Iodides yield a yellowish precipitate with silver solutions, bright yellow with lead, and red with mercuric chloride. On adding chlorine water and starch paste a deep blue color results. To a dilute solution of potassium iodide add a few drops of carbon disulphide, then some chlorine water, and shake. The iodine is liberated, and dissolves in the carbon disulphide with a beautiful violet color. A large excess of chlorine will destroy the color.

IN 1881, 64 tourists ascended Mont Blanc, namely: 19 French, 17 English, 6 Americans, 11 Swiss, 6 Germans, 3 Italians, 2 Austrians. Three ladies were included, who were respectively English, Swiss, and French.

MENTAL INFLUENCE IN CATCHING COLD.

IT has often occurred to us that the influence of the mind might have something to do with the apparent anomalies in our experience of taking cold, and we were consequently much interested in the following remarks on the subject in a recent number of the London *Lancet*: —

It is noteworthy as a curious yet easily explicable fact that few persons take cold who are not either self-consciously careful or fearful of the consequences of exposure. If the attention be wholly diverted from the existence of danger, by some supreme concentration of thought, as, for example, when escaping from a house on fire, or plunging into cold water to save a life, the effects of "chill" are seldom experienced. This alone should serve to suggest that the influence exerted by colds falls on the nervous system. The immediate effects of a displacement of blood from the surface and its determination to the internal organs are not, as was once supposed, sufficient to produce the sort of congestion that issues in inflammation. If it were so, an inflammatory condition would be the common characteristic of our bodily state. When the vascular system is healthy, and that part of the nervous apparatus by which the calibre of the vessels is controlled performs its proper functions normally, any disturbance of equilibrium in the circulatory system which may have been produced by external cold will be quickly adjusted. It is therefore on the state of the nervous system that everything depends, and it is, as we have said, on the nervous system the stress of a "chill" falls. Consciousness is *one* element in the production of a *cold*, and when that is wanting the phenomenon is not very likely to ensue. It is in this way that persons who do not cultivate the fear of cold-catching are not as a rule subject to this infliction. This is one reason why the habit of wrapping up tends to create a morbid susceptibility. The mind by its fear-begetting precaution keeps the nervous system on the alert for impressions of cold, and the centres are, so to say, panic-stricken, when even a slight sensation occurs. Cold applied to the surface, even in the form of a gentle current of air somewhat lower in temperature than the skin, will produce the "feeling" of "chill." Conversely, a thought will often give rise to the "feeling" of cold applied to the surface, — for example, of "cold water running down the back." Many of the sensations of cold or heat which are experienced by the hypersensitive have no external cause. They are purely ideational in their mode of origination, and ideal in fact.

NEW LECTURE EXPERIMENTS.

IN a recent number of the Berlin *Berichte* Max Rosenfeld describes an experiment for exhibiting the change in weight that attends oxidation or reduction, without the aid of a chemical balance. A modified form of hydrometer takes the place of a balance. The ordinary saccharometer has attached to its upper end, by means of sealing-wax, a piece of strong wire, 10 cm. (4 inches) long, and to the other end of the wire is fastened a glass cup, made by cutting off a test tube. On the cup is placed a piece of platinum foil to hold the substance to be burned or reduced. The instrument is so adjusted that a weight of 0.8 to 1 gram on the foil will cause it to sink until the wire is a little way under water. It now resembles a Nicholson's hydrometer, and is very sensitive.

To perform an experiment in oxidation, enough finely divided iron is put on the foil to cause it to sink until the end of the wire is in the water. The foil with its load is carefully removed, and held over a flame until the iron is converted into oxide. When cold it is replaced on the glass cup, and causes the instrument to sink until the cup almost touches the

water. To show the loss of weight by reduction, the foil is loaded with copper oxide until the cup nearly touches the water. After it is reduced to metal, of course, the apparatus sinks to a much less depth. A cylinder made of copper oxide and gum water, and well dried, can be used to show both oxidation and reduction.

Brössler, of Vienna, has recently described several methods of making phosphoretted hydrogen for lecture experiments. He places some granulated zinc in a glass dish, and adds dilute sulphuric acid until bubbles of hydrogen gas are given off regularly, but not too rapidly. He then throws in a few pieces of ordinary phosphorus. In a short time the bubbles of gas begin to ignite at the surface of the liquid with a slight explosion. To hasten the operation, the dish and its contents may be warmed to 40° or 50° C. on a sand-bath, or the necessary heat can be generated by putting the zinc in cold water, and pouring concentrated sulphuric acid upon it.

If a solution of caustic potash and granulated zinc is heated to 60° C., and a few pieces of phosphorus thrown into it, bubbles of the spontaneously inflammable gas will also be given off.

The hydrogen generated by the action of concentrated hydrochloric acid upon zinc is not adapted to the generation of this inflammable gas, but the addition of a few drops of concentrated nitric acid produces the desired effect.

HOUSEHOLD RECIPES.

Cleaning Foul Stove-Pipes. — An exchange says that a piece of zinc placed upon the live coals in a hot stove will effectually clean out a stove-pipe, the vapor produced carrying off the soot by chemical decomposition. While we doubt its efficacy, we give the remedy for what it is worth.

Stove Blacking. — The most lasting polish is obtained by first brushing the stove with a syrupy mixture of lampblack and soluble glass, and letting it dry for twenty-four hours. Then apply a syrupy mixture of black-lead and mucilage, and polish by brushing before the last coat dries.

Removal of Grease Spots. — Whenever oil of turpentine, benzole, or ether is used to remove grease spots on cloth, the application should be made on the reverse side of the cloth by moistening it with the solvent in a circle surrounding the spot, so as to approach it gradually, having blotting-paper in contact with the spot of grease to absorb the fat immediately; otherwise the solvent will have the effect of spreading the grease over a larger surface instead of driving it out of the cloth. In the application of a hot iron to one side and blotting-paper to the other, the heat will drive the grease out of the cloth into the paper, because the fat has a tendency to move from the hotter parts towards the cooler.

How to Cleanse Mica. — Every woman who has been obliged to spend half a day several times during the winter cleaning the plates of mica in her coal stove, usually by taking them out and washing them in soapsuds, will rejoice to know that there is no need to take them out or let the fire burn very low in order to do it successfully. Take a little vinegar and water and wash the mica carefully with a soft cloth; the acid removes all stains, and if a little pains is taken to clean the corners thoroughly and wipe them dry the mica will look as good as new. If the stove is very hot, tie the cloth to a stick, and so escape the danger of burning your hands.

Clinkers in Stoves. — In reply to the query how to remove clinkers the *Manufacturer and Builder* says: The coal is to blame for the formation of clinker. The constituents of the ash of certain coals, and sometimes the stony impurities from which the coal has not been carefully freed, will, when the fire is very intense, fuse down more or less completely, and form the mass known as clinker, which becomes especially troublesome when it attaches itself to the fire-brick lining of the fire-space, from which it can be removed only by the use of the hammer; and unless very carefully performed, this operation is likely to fracture the bricks. The only way to avoid the annoyance of clinker is to dispense in future with a coal that is known to form it.

Practical Chemistry and the Arts.

DAMP HOUSES.

This subject is one of such universal and individual interest that we feel justified in presenting to our readers a few abstracts from a series of papers recently published in a French journal by G. Philippe, a civil engineer of Rouen.

The *causes* of dampness in buildings are: (1) the presence of water in the atmosphere and the soil; (2) the porosity of building materials, which absorb it.

Its *effects* may be classified as (1) disintegration of masonry, with injury to wall-papers; (2) decay of timber, with injury to wooden furniture; (3) development of saltpetre on walls, with injury to wall decorations; (4) injury to health of inhabitants.

The *prevention* and *cure* of damp may be attempted by: (1) employment of suitable materials for cellars, and other parts of buildings below or on the level with the soil; (2) damp-courses to stop the upward progress of damp; (3) preparations of different natures, either to protect the face of an exposed wall from the weather, or to prevent damp in the wall from affecting an apartment; (4) precautions against infiltration.

The most thoroughly sanitary foundation for a building is concrete; and the author recommends covering the whole level of the future building with a layer four inches thick, composed of two thirds broken flints well washed and one third mortar made of lime and gravel sand. He estimates such a layer would cost about five cents per square foot.

A layer of well puddled clay eight inches thick may be spread over the site of the building, and extended for about sixteen inches outside of the walls, and carried up with the wall on the outside until the level of the soil is reached.

To destroy the porosity of building materials they may be injected with gas refuse, or immersed successively in solutions of soap and alum. The result is to fill the pores of the brick or stone with a fatty substance, which opposes the passage of water. The method preferred by M. Philippe is to plunge the material into a solution of silicate of potash merely long enough to allow all the air bubbles to disengage themselves from its surface, and then lay it aside for forty-eight hours before using.

The walls of cellars may be lined with a layer of cement one inch thick, but M. Philippe does not recommend the French Portland cement, as it very imperfectly excludes damp, and is easily penetrated by saltpetre. Both soap and alum, as well as hot gas tar, can be applied to walls already erected. In 1813 the cupola of the church of Sainte Genevieve was painted with a preparation consisting of one part of wax and three parts of boiled oil, with one tenth its weight of litharge, applied at a temperature of about 212° F., the wall having been previously heated by means of a large gilder's stove. Successive coatings were applied until no more could be absorbed. When dry, a coating of white lead mixed in oil was superposed, upon which the painting was to be executed.

Parquets may be preserved by laying them upon bitumen. The *Journet patent* for dry floors or areas consists in laying down a bed of cement about two inches thick, in which small pipes are laid, at about one inch apart, and then covered with another two-inch layer. When the cement begins to harden the pipes are drawn out by the end, leaving hollow tubes, through which air can circulate if proper openings are left in the walls.

Silicate applied to the surface of buildings renders them almost impervious to the action of the weather. It has been applied by M. Kuhlmann to the principal monuments in the town of Lille, and to the new buildings of the Louvre, in Paris. It is stated that silicates cannot be used upon walls where saltpetre has been or is likely to be developed.

CONCERNING PETROLEUM.

Solidified Petroleum. — According to a St. Petersburg paper, a German, Herr P. N. Dittmar, has practically solved the problem of rendering petroleum solid, — a problem considerably studied by chemists of late in view of the large question of transport. A company has been formed in Russia to work the patent when completed. The transformation of the substance will not cost more than about 6 cts. per 36 lbs. (6 copecks per pood), whereas the casks now used increase the cost of petroleum about 55 cts. for the same quantity (55 copecks per pood), leakage not considered. The mode of treatment is not yet disclosed, and chemists to whom small samples of the solid petroleum have been sent have not been able to make out the nature of the foreign substances that are added in a proportion of 2, or at most 3, per cent., to solidify the petroleum. The reporter of the St. Petersburg paper saw the product: he says it is of a wine-yellow color, and has the consistency of very stiff gelatine; it can be kneaded with the fingers like wax, and is yet somewhat breakable. A small piece of the thickness of a lead-pencil and about an inch long could be lit at one end and held with the fingers. It melted like wax, and it was only after a time, when hot drops ran down, that the flame had to be blown out. The danger of fire is considerably less than with liquid petroleum. The product can be easily liquefied, when required, by the addition of vinegar, and the process is rapid. The vinegar in time separates out below and the petroleum above. It is not stated whether the same vinegar can be used repeatedly. It appears that the higher and lower boiling hydrocarbons in crude naphtha are not affected by the solidifying agent; in which case the costly apparatus for fractional distillation might be dispensed with.

Paper Barrels for Petroleum. — A whole cargo of petroleum was lately shipped in New York in paper casks. These casks are made by a company which has three works for the purpose, — at Hartford, at Cleveland, and at Toledo. Some 3000 are delivered daily; they are painted blue, and have iron hoops, and they are $1.35 apiece (a price which could be reduced in case of large production). The advantages of these compressed paper barrels consist chiefly in the absence of joints, and less loss on that account through leakage; great elasticity and less liability to fracture than where wood is used; lastly, less dilatation, and diminution of expenses thereby incurred. It is said the Standard Oil Company is going to substitute the manufacture of paper barrels for that of wooden ones, which it at present exports in large quantity.

PETROLEUM SOAP. — L. Bastil, a French chemist, has obtained a patent for a petroleum soap in which equal proportions of animal or vegetable fats are used with petroleum. The fatty matter is melted, and a small quantity of boracic acid is fused into it. A similar quantity of boracic acid is in like manner added to the mineral oil at the temperature of 90° Fahr. The chemist also dissolves a similar quantity, one half per cent., of boracic acid in his alkaline solution. The partially acidified animal or vegetable fat and the mineral oil are mixed by gradually pouring the melted animal or vegetable fat into the mineral oil, and constantly stirring or agitating. He then gradually adds the alkali containing the boracic acid, while still maintaining the agitation. The saponification is completed by further addition of as much ordinary alkaline solution as may be required, and finishing off pretty nearly in the usual manner.

MILK TO EXTINGUISH PETROLEUM. — The first impulse of the inexperienced is to throw water upon burning kerosene oil, but the oil, being lighter than the water, rises upon it, and the only result is to make the fire spread. Several cases have recently been reported in the *Metal Worker* where milk has proved an efficient extinguisher when every other means had failed. It may be doubted whether the well-watered milk that reaches city tables would answer. The question also arises whether it would not be well to put a little milk in our lamps on filling them, so if they happen to explode, or are broken by a fall, the milk will be there, ready to act at once, without waiting for the milkman to come around.

LABORATORY NOTES.

USES OF ASBESTOS IN CHEMICAL LABORATORIES. — The remarkable properties of asbestos, such as its non-combustibility and its resistance to the action of acids, render it peculiarly well adapted for use in chemical operations. It was employed centuries ago for the process of filtration of liquids, a plug of the material being inserted in the neck of the funnel through which the liquid was poured. The asbestos paper produced at the present time presents an excellent material for filter paper, as the latter can be washed an almost infinite number of times without being destroyed. The working tables of laboratories may be furnished with coverings of thick sheets of this paper, which coverings prevent any destructive action of acids, however strong the latter may be. In addition, the material is elastic to such an extent that articles of glass may be allowed to fall upon it without serious risk of fracture. The paper under consideration is, moreover, employed in the manufacture of porous cells for electric batteries, gloves, coverings for the hands when handling corrosive products, and various other articles of utility.

DIALYSING VESSELS. — We learn that a German patent has been taken out for filtering and dialysing vessels of clay, which is rendered porous after burning by being mixed with granulated vegetable charcoal, the grains varying in diameter from the 300th to the eighth of an inch. If the dialytic method of preparing tinctures and extracts should come into vogue, such vessels will be much more convenient than the usual parchment-paper diaphragm.

EXTRACT OF TANNIN. — Gondolo extracts the active constituent of barks by means of solutions of alkaline sulphites or bisulphites. The solution is bleached by the liberated sulphurous acid, and clarified by means of blood. This extract will penetrate the thickest hides in a short time.

NEW REAGENT FOR POTASSIUM. — If a solution of cobalt nitrate be mixed with one of sodium nitrite acidified with acetic acid, a clear but dark yellowish purple solution is obtained, which, say Curtmann and De Koninck, can be used as a test for potassium salts. With a concentrated solution of any potassium salt, chloride, sulphate, phosphate, nitrate, or acetate, it gives, at once, the well-known yellow precipitate of potassio-cobalt nitrite, obtained in separating nickel from cobalt. In dilute solutions the precipitate forms more slowly.

DIALDANIC ALCOHOL. — A. Wurtz describes in *Comptes Rendus* an alcohol having the composition $C_8H_{16}O_3$. It is at the same time a primary and a secondary alcohol and an ether. It forms a white crystalline mass, deliquescent, and soluble in water as well as in alcohol and ether.

IRON AMALGAM. — According to *Design and Work*, sodium amalgam in the presence of water and finely divided iron forms an iron amalgam, the composition of which is nearly represented by the formula Hg_3Fe_2. Raman, who discovered this singular fact, says that dry sodium amalgam has no action upon iron.

LABORATORY UTENSILS FROM PAPIER-MACHÉ. — R. H. Paulcke has recently put on the Leipsic market a cheap form of funnels, capsules, etc., made from *papier-maché*, and covered with a protecting varnish. The *Chemiker Zeitung* has tested these vessels, and finds that they are unaffected by strong acids, including sulphuric acid of 66° B., or by strong alkalies. Alcohol, ether, benzole, carbon disulphide, and other solvents do not attack the varnish. It seems probable that they will prove very serviceable, as they do not break like glass, nor melt like gutta percha, nor oxidize like the common metals.

PRACTICAL RECIPES.

TINNING CAST IRON. — To coat iron with tin the *Metalarbeiter* recommends to dissolve 1 part protochloride of tin in 10 parts of water, and also 2 parts of caustic soda in 20 parts of water. On mixing the two solutions they become turbid, but this does not interfere with the tinning. The object to be tinned is heated before it is put in the bath. During the operation, a perforated plate of block tin is put in the bath and moved with a rod of tin.

Another recipe recommends to boil 3 parts of rye flour for 30 minutes in 100 parts water, and strain it. To this clear but thick liquid are added 106 parts of phosphate of soda, 17 of crystals of chloride of tin, 67 of chloride of tin solution, and 25 of sulphuric acid. The carefully cleaned articles are simply dipped in this bath for a short time.

LABELS ON TIN. — A very good method of causing labels to adhere to tin is a dilute solution of white gelatine, or, better still, of isinglass. Its strength should not be more than one in twenty, and it may be applied by means of a pencil or sponge. It has this advantage, that labels applied to the surface so covered do not adhere permanently at once, but may be slid about long enough to permit their proper adjustment and straightening.

BLACK INK. — Dissolve 2 ounces of borax in a quart of boiling water, and add 4 ounces of shellac. Boil until the shellac dissolves, and then add 2 ounces of gum arabic dissolved in a little hot water, and boil again. Then add a sufficient quantity of a well-triturated mixture of equal parts of indigo and lampblack to give it the desired color. Let the whole stand a few days; then draw off, and bottle the clear liquid.

WATERPROOF CANVAS FOR COVERING CARTS, ETC. — Nine and a half gallons linseed oil, 1 lb. litharge, 1 lb. umber, boiled together for 24 hours. May be colored with any paint. Lay on with a brush.

NEW METHOD OF NICKEL-PLATING. — Instead of employing an ammoniacal double salt of nickel in an alkaline solution, Powell uses a neutral or slightly alkaline solution, containing certain organic acids. He dissolves 90 parts by weight of sulphate of nickel, 25 of citrate of nickel, and 15 of benzoic acid in 4000 of water.

Agriculture.

NITROGEN

IN ITS RELATIONS TO AGRICULTURE.[1]

THE element nitrogen, in its nature and chemical relationships, is not clearly understood among farmers, and this is annoying to many, as it is constantly spoken of in agricultural literature. The cause of this indistinct understanding or misapprehension arises from the way in which it is necessary to speak of it in relation to its cost or value as plant food, and of the office it subserves in vegetable physiology. Nitrogen in its naked or gaseous condition is quite unlike its various compounds, and it is only in some one of its combinations that it possesses any interest for the farmer. It has not been unusual for us to receive letters asking where nitrogen can be purchased by the pound or ton, and what kind of vessels are needed to hold it. It is certainly desirable that its nature should be better understood.

Nitrogen belongs to a class of bodies which are incapable of influencing any of the senses so far as to be recognized by them. It cannot be seen, tasted, nor touched so as to produce tangible impressions, and it has no odor. During all the ages, until within little more than a century, mankind were wholly ignorant of its existence. It is a form of matter found in a permanently aeriform state, or as a gaseous body, which under no ordinary or usual conditions can be made to assume a solid or liquid form. The atmosphere is its home and hiding-place, and therefore it is constantly in close proximity with our bodies, and with everything existing upon the earth. It passes into the cavity of the lungs of all breathing animals at every inspiration, traverses the circuit of the air-cells, and is expelled as nitrogen without diminution of volume or any chemical change whatever. The volume of free nitrogen in the air is immense, and its weight as it rests upon the earth's crust can be understood only by a consideration of the figures which approximately represent it. The nitrogen of the air can be separated from the oxygen and other gases and vapors present over the earth's surface, and weighed. One thousand pounds of air contain of — .

Nitrogen	755 lbs.
Oxygen	234 "
Carbonic acid	1 lb.
Aqueous vapor	10 lbs.
	1000 "

The whole weight of the nitrogen contained in the gaseous envelope of our planet may approximately be stated to be three quadrillions, nine hundred and ninety-four trillions, five hundred and ninety-two billions, nine hundred and twenty-five millions of tons! The commercial value of nitrogen — as presented in the estimates of chemists who make analyses of fertilizers — is about twenty cents a pound. If we apply this price to the great volume of nitrogen around us, the value would attain a point almost beyond the reach of figures to demonstrate. For crop purposes the nitrogen of the air is valueless to the farmer; for although it comes in direct contact

[1] Paper read by Dr. Nichols at meeting of Massachusetts State Board of Agriculture, State House, Boston, February 1, 1882.

with his soils, mingling with them to considerable depths, the spongioles of plants, penetrating everywhere, are not endowed with the power of appropriating it to their uses, or combining it with their structures. It also comes in direct contact with the surfaces of plants above ground, but this contact is productive of no combination or assimilation; vital plant structures and dead nitrogen when brought together do not permit the play of chemical affinities which result in chemical unions. From a careful and candid consideration of the experiments which have been made with a view to ascertaining whether there is any absorption of nitrogen by the leaves or other external organs of plants, we have no hesitation in saying that they must be regarded as complete failures.

The affirmative results which some experimenters state to have been reached are totally unreliable, and the question stands to-day a settled one, and that in the negative. Nitrogen in many of its aspects and in its behavior must be regarded as the most remarkable of all the elements. The popular notion of its use in the atmosphere, that it is simply a diluent of oxygen, is probably correct. It must subserve other and important purposes, but to ordinary observation it appears to have been supplied by the Supreme Intelligence for the main purpose of so attenuating oxygen as to keep it within safe bounds as a respiratory agent and supporter of combustion. It is the most stupid, so to speak, and negative of the large family of elements. It resists chemical combinations with remarkable persistency, and when forced into such unions the affinity is slight and disruption is easy. It may be said to be the most unimportant and yet the most important of all the elements, — a paradoxical statement easily comprehended by every chemist. It is docile, negative, unaggressive, in its natural state, but when forced into combination with oxygen it gives us acids with teeth sharp enough to gnaw a file. When combined with potash, and the resultant salt mixed with a little sulphur and charcoal, it gives us gunpowder, an agent well known to possess extraordinary properties. When associated with the bland and sweet substance known as glycerine, it forms nitro-glycerine, dynamite, lithofracture, giant-powder, — agents so terrible as to appal mankind by their destructiveness. Shreds of cotton picked from the ripened bolls which open to the Southern sun, when placed for a few moments in the acid which is born of nitrogen, suddenly lose their innocent nature, and each becomes a giant in power, capable of levelling forests and mountains at the touch of fire. Nitrogen forms the basis upon which rest the great chemical forces so destructive and yet so useful to the race. It comes out of its chemical unions with a crash terrible and irresistible, but it at once assumes its usual dead condition, and floats in the air with all the harmlessness of the summer breeze. When introduced into the human or animal organism, it originates and sustains nervous or muscular force. We move our limbs and conduct the physical labors of life through the agency of nitrogen or its compounds. Our animals — the oxen and horses which we rear — are serviceable in the yoke and harness only through the changes resulting in the combinations and elimination of nitrogen. After it has served its purpose in the body, it does not as a whole escape into the air, as when it is set free by explosions, but it appears in the liquid and solid excrement in certain forms of combination, which, to become fixed and serviceable as plant food, must receive intelligent care. The proneness of nitrogen to disassociate or free itself from its combinations is seen in the changes which excrement undergoes soon after leaving the animal organism. So long as nitrogenous compounds are controlled by the vital forces of animal life they are held in check and their equilibrium is preserved, but as soon as the external air is reached it struggles to free itself from its environments. The highly organized compounds take on fermentative changes; hydrogen is evolved, another gaseous body, and the nitrogen is led into an alliance with this element in such proportions as to form ammonia. Ammonia is distinguished for its volatility or readiness to escape, whether it be free or in the form of a carbonate. When nitrogen seeks to escape through this agent it must be fettered by forcing it into new and stronger combinations.

The sulphate of ammonia is a stable body capable of restraining nitrogen, and hence, if we apply to fermenting manure-heaps sulphate of lime, or what is known as plaster, sulphate of ammonia results, through a process of double decomposition, and we have a nitrogenous salt, permanent and well adapted to the purposes of plant nutriment. It has already been stated that nitrogen has no value for farm purposes in its elementary, gaseous state, but when in chemical union with oxygen or alkaline bases it becomes a factor in successful husbandry of the first importance. An interesting inquiry arises at this point: Through what natural agencies is nitrogen fitted to become plant food? How does it happen that an element so shy and indifferent is found in soils in a combined state so as to be assimilable by growing vegetation? Investigations made at our experimental farm in Essex County during the past twenty-five years lead to the conclusion that the most prominent source of fixed nitrogen found in soils comes from the atmosphere. We are quite certain that most chemists are in error in regarding as of comparatively small consequence this source of the agent. The view that nitrogen and ammonia are simply accidental agents in the air, and very sparsely diffused, is founded upon incorrect or superficial experiment and observation, and must, it seems to us, be abandoned.

Experiment and observation have convinced us that nitric acid and ammonia are essential and natural constituents of the atmosphere, and of so much importance, and so considerable in amount, that by no means can they be made to take a secondary place in any estimate of the sources of nitrogen in soils.

Quite early in our experiments, before science had shed so great light upon the chemistry and physiology of plant growth, we were perplexed to understand how it happened that the quantity of nitrogen removed in a series of crops was much greater than that contained in the manures employed, and this too when percolating rains and drainage were carrying away no inconsiderable quantity. Analysis proved that nitrogen was present in large quantities in some uncultivated or virgin soils on the farm, and also it was found in considerable amounts in the swamp muck contiguous to the uplands: areas which had never been cultivated, or received a particle of manure from any source. It became not only evident that nature had hidden sources of supply, but that in some way a remarkable equilibrium is maintained between want and supply without the husbandman's intervention.

Experiments upon fields, cropping without supplying nitrogenous manures, carried on over a period of fifteen years, gave crops of the cereals in diminished amounts. The soil at the end of that period afforded, upon analysis, evidence of the presence of nitrogen, though the quantity removed in the crops was much greater than had been contained in the soil at the commencement of the experiments. This proved that somehow, from somewhere, nitrogen was spontaneously furnished in the ordinary processes of nature. The amount of nitrogen returned to the soil in the husbandry of the early settlers in this country was really very small. The manures they produced from their animals were cared for in so slovenly a manner, being exposed to rains and snows, and allowed to drain away into marshes and ditches, that they were of small nitrogenous value when used in the field. They could not indeed be of high value when well protected, as the grasses upon which the animals were fed were of a low order and inferior quality. The virgin soils, when well situated, were rich in nitrogen, and gave heavy crops of wheat and other cereals, but they gradually languished, until the raising of wheat, a grain demanding much nitrogen, no longer proved remunerative, and its cultivation to a large extent ceased.

New England soils, at the dawn of scientific agriculture, thirty years ago, were apparently in a fixed condition; fifteen or twenty bushels of corn could be got from an acre, small crops of barley or oats, but no wheat in paying quantities. The supply of nitrogen was at a minimum, and it probably varied but little from year to year, unless on fields which received more enlightened culture from owners than was usual throughout the country. These facts all tend towards one conclusion: that the spontaneous supply of nitrogen on soils physically well adapted to grains and rich grasses is tolerably constant, and is sufficient for the sustentation, growth, and maturity of small crops from year to year, without additions from outside sources.

Some lands, originally well supplied with nitrogen, become sterile under repeated croppings with the cereals, but such are peculiar in physical characteristics, and not well adapted to receive and retain manures of any kind. As is well known, the tendency of all soils is towards exhaustion, when drawn upon by successive crops of the noble grains and grasses, but this exhaustion seems to have a limit, so far as it is due to the loss of nitrogen.

As gaseous nitrogen is rejected by plants, we must assume that it reaches them through the nitric acid and ammonia always present in the atmosphere.

Every shower of rain, every fall of snow or dew, brings with it to the land a variable but large supply of these bodies, and they are diffused through the moist earth and held for the use of vegetation. It is a very remarkable and significant fact that the amount of nitrogen supplied through the sources indicated varies on dif-

ferent fields, often on the same farm, and under similar meteorological conditions. This fact has not been noticed by writers and experimenters, so far as our knowledge extends. It appears clear, from the results of experiments at our farm, that no two fields receive precisely the same amount of natural nitrogenous products in a season, or in a succession of seasons; and we are inclined to think it is a law of nature that the physical condition of soils (conjoined, perhaps, with chemical conditions) determines the amount of nitrogen they are capable of receiving. It may be true that if we only knew just what conditions were requisite, the spontaneous supply of nitrogen could be made ample for all our wants. It seems to us that facts and observation point in this direction, and the suggestion, though new, is worthy of consideration.

We have found that fields kept in high culture by constantly stirring and pulverizing the soil, without the use of nitrogenous manures, uniformly give a much higher percentage of nitrogen, upon analysis, than adjacent fields which are comparatively at rest, the crops being the same in kind.

It is well known that a crop of clover raised upon a field and turned under in a green state adds greatly to the fertility of the field, by increasing the supply of nitrogen. We have found, upon analysis of the soils of such fields, before and after the decay of the clover, that the nitrogen present was greater after the crop than the amount originally present in the soil, added to that contained in the clover. If the leaves and external organs of clover are incapable, as we feel certain they are, of assimilating gaseous nitrogen, it may be they are capable of appropriating nitrogen in the form of nitric acid and ammonia from the air.

We have not conducted experiments far enough in this direction to settle the matter in our own mind, but we know the view quite generally prevails among chemists that it is not through the roots alone that clover, and perhaps some other plants, receive nitrogenous food. We are still much in the dark upon this interesting question: it is a darkness, however, which, we are confident, will be dissipated by further and more intelligent research.

As regards the sources of the compounds of nitrogen in the air, we have only to point out the agency of the electrical forces and the escape of free ammonia from industrial establishments, putrefactive fermentations, and a thousand other natural and artificial sources. How far the play of electrical activities in the atmosphere, which are silent and unseen, may conduce to the union of nitrogen with oxygen, we do not know, but we have good reason to suppose that these are by no means insignificant. We do know that nitric acid is produced in large amounts during thunderstorms, when disruptive discharges of electrical force are constant and powerful, and during cyclones and tornadoes the production must be immense. We have only to add that in the view of many chemists the electrical influences in the soil promote the fixation of free nitrogen to certain substances, and hence supplies of nitrogenous aliment reach plants through this agency. It is tolerably certain that this view is correct, but to how great extent this change is carried we do not know. We do know that through the process of nitrification nitrogen in soils under peculiar conditions is forced into combination with the alkaline bases, potash, soda, and lime, and it may be that other changes are occurring, tending to fix free nitrogen, of which we are ignorant at present.

Conclusions based on the present state of knowledge lead to the belief that the sources of nitrogenous compounds in nature brought, or capable of being brought, within the reach of vegetation are more numerous and the supply much greater than has hitherto been supposed. There is indeed much to support the pleasing hope that ultimately, or in the near future, our knowledge will be so extended as to make it easy to aid nature in producing the chemical union of nitrogen with oxygen, and utilizing the products on lands.

The researches of a quarter of a century in the field and laboratory lead us to conclude that nitrogen in available forms will not long command the high prices which it now sustains, as presented in industrial products. Within a third of a century we have had opened to us inexhaustible supplies of the other two great essentials of plant food, potash and phosphoric acid, and it is through a closer understanding of chemical reactions and nature's laws that nitrogen is to be supplied to agriculture, under such conditions as immensely to promote the interests of husbandry.

GLEANINGS.

The Best Breed of Cows for Butter-Making. — A writer in the *Country Gentleman*, in reply to a question as to the best breed of cows for the making of butter, remarks: "I unhesitatingly say, the Jersey or Guernsey of superior strains. My preference would be for Jerseys, and I speak from an experience of fifteen years. The butter of the Jersey is of very fine texture, and admirably adapted to packing. If one does not feel like incurring the expense of a herd of thoroughbred Jerseys, then I would advise his stocking his farm with grade Jerseys, and by the use of a Jersey bull continue to grade up till he approaches closely the purity of the thoroughbred. He would probably have difficulty in finding any one willing to dispose of grade Jerseys, even, save at an advance of fifty per cent. above the price of ordinary cows; so that if the original outlay is a matter of importance, I would suggest the alternative of selecting the best common cows that he can find; then buy a first-class Jersey bull, and raise a herd from the best of his purchases. In selecting natives he need not hunt for large milkers, — 20 to 24 quart cows, — but take cows of 15 to 16 quarts tested capacity, with rich yellow skins, and he will find them on the average better for butter. With a Jersey bull of an excellent butter family, he will soon have a herd that will rival the thoroughbreds as butter makers."

"The Cow is Queen." — At the recent meeting of the Illinois dairymen's association a paper was read by a member urging that "the cow is queen, and her product is king." In view of the fact that the number of milch cows in the Northwest has increased 60 per cent. in 10 years, it was argued that the commercial supremacy once claimed by cotton, and since by corn, really belonged to butter and cheese.

Are Bumble-Bees Useful? — An exchange says that a bee-keeper in Los Angeles, Cal., has received an order from Australia for several colonies of bumble-bees. They are wanted to distribute the pollen of the clover fields, so as to fertilize the seeds.

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, MARCH 1, 1882.

VACCINATION.

The efforts which are made by persons actuated by ignorance or vulgar conceit to prejudice the popular mind against vaccination are reprehensible in the highest degree. During the past ten or twenty years there has existed in England and in this country a class of men who have not only endeavored in all possible ways to weaken the general confidence in the efficacy or protective influence of kine-pox vaccination, but have also labored to excite apprehensions of great evils to result from the practice. Consequently, from its large avoidance on the part of individuals and families, the dreadful scourge of small-pox has gained considerable foothold in some parts of the country.

It would seem as if there could be found other forms of mischief, less fatal to human happiness and safety, for the ignorant and vicious to engage in, without exciting prejudice against Jenner's great and beneficent discovery. Before his time, small-pox was a disease which excited more terror among the nations than even war or famine. Its loathsome nature, conjoined with the fatality which attended its course, conferred upon it a dread of which we, living since the discovery of vaccination, can form no adequate conception.

Since Dr. Jenner discovered that the disease when passed through the organism of animals is radically changed in its nature, and assumes a mild and not dangerous form, and that this modified type, when transplanted from animals to the human organism, is sufficient to protect against the virulent forms of the poison, mankind have in a great measure ceased to regard it with terror. The filthy and destructive monster has been shorn of his power and sway over human life and happiness, and the few scattered cases of the disease which occasionally occur in cities and towns have produced no alarm, and have received but little public attention.

The statements regarding the dangers of kine-pox vaccination are enormously exaggerated; in fact, they are false in general and in detail, and they are as wicked as they are false. There are persons so morbid in their physical organizations that the slightest abrasions of the skin will cause inflammation and pus formations in the irritated parts, and these may spread so as to become perhaps serious in their character. Hence have come notions that the introduction of virus, and not the puncture, causes the evils which are sometimes noticed. No two persons are influenced precisely alike by the introduction of virus into the system; some are seriously affected, whilst others suffer no special inconvenience. So long as human beings differ widely in their spiritual and physical natures, disease of whatever form will produce results without uniformity and with manifestations totally unlike. Virus taken at its right stage from the arm of a healthy child, or from the udder of a healthy cow, is procured in its best and most effective forms, and if any one refuses to be brought under its protecting influence

through ignorant prejudice or vulgar timidity, he must understand that by such neglect he assumes responsibilities which extend much beyond himself. It is quite time that the spread of baneful influences like those which are exerted against vaccination were arrested, and every sensible right-minded man and woman must aid in the work.

THE NAVY AS AN AID TO SCIENCE.

Our navy is a small one, compared with the vast establishments of England, France, and other European nations, but it nevertheless costs a good deal of money, for which, in these times of peace, we seem to get but small practical returns. It is with much gratification, therefore, that we learn of the plan for utilizing the navy to a greater extent than heretofore in scientific research. Sundry cadet midshipmen, whose names are announced in the Washington papers, have recently been ordered to the Smithsonian Institution for special duty, under the direction of Professor Baird. This makes a new and important departure by the navy department, the action being taken with a view of adding to the course of the Annapolis Naval Academy some practical education and training in natural science. This is to be done not only in the hope of increasing the general intelligence of the navy, but with the view that it may aid not inconsiderably in scientific research, both upon our own coasts and waters and in other parts of the world. The suggestion, which has been for some time under consideration by Secretary Hunt, came from Admiral Rodgers and Professor Munroe, of the Naval Academy. The secretary says: "I have given orders that a few men, — a half dozen, perhaps, — known to have scientific tastes and general intelligence, be detailed for duty at the Smithsonian Institution, to be assigned by Professor Baird as he may see fit, being governed largely by their scientific tastes and the lines of natural science which naval service would naturally open to them." Professor Baird said: "It seems to me that our navy, if properly educated, may be made quite a valuable accessory to scientific research, without at all detracting from its usefulness or causing a neglect of its duties."

We trust that the success of this promising experiment may be such as to lead to further and more important efforts in the same direction. "Peace hath its victories as well as war;" and we shall rejoice to record naval triumphs of this character, — scientific conquests in distant waters and among the islands of the sea, which, though they do not extend the borders of the republic, may enlarge that great domain of knowledge which is the joint possession of all nations.

HOW THE STREETS ARE CLEANSED IN PARIS.

The streets of Paris are probably cleaner than those of any other city of its size in the world. To keep them clean, a staff of 2,200 men, 950 women, and 30 boys are employed. In addition to these there are 190 mechanical sweepers, each doing the work of ten men. The roadway, swept and cleansed by six or seven o'clock in the morning, amounts to nearly 13,000,000 square yards. The amount appropriated for street cleaning is about $35,000, which does not include the disinfecting of markets, urinals, etc., which costs over $40,000, including chemicals and plant.

The sweepers employed are similar to those in use in this city, consisting of a frame-work upon two wheels, with a seat for the driver, and at the back is an inclined circular bass broom, actuated by gearing driven from one of the wheels. Each machine costs $200, and will sweep 6578 square yards per hour. Two of these machines are usually driven down the street, one following closely after the other. The first sweeps the middle of the roadway; the second takes the winnow of dirt formed by the first, and carries it to the side of the road, perhaps into the gutter. A strong current of water from the nearest hydrant hurries it on into the sewer, women with long brooms helping it along. The water is allowed to flow for some time, being dammed here and there by the attendants, who change the direction of the current, until the last bit of filth is washed away. In some parts of the city the sweepings are collected in carts, of which 500 are employed; but Paris mud no longer possesses the manurial strength of former times, and the receipts derived from this source have greatly diminished.

The scavenging plant is kept in a central depot, where materials of every description are stored and classified, for ordinary and extraordinary service. Here are found supplies of chloride of lime, sulphate of zinc, sulphate of iron, and carbolic acid as disinfectants, and hydrochloric acid and nitro-benzole as cleansing agents. Chloride of lime is used of a strength of 100° to 105°, sulphate of zinc at a strength of $\frac{1}{8}$; carbolic acid is used at a strength of 1 to 40, and down to one per cent., and even less. For watering streets and gutters it is used as weak as 1 of acid to 1000 of water. Hydrochloric acid is applied to urinals and slaughter-houses at a strength of $\frac{1}{8}$ to $\frac{1}{10}$. Nitro-benzole is employed of the same strength, but produces a disagreeable smell of bitter almonds.

The watering of the streets is mostly done by hose, or a system of jointed pipes mounted on small wheels; but 322 watering carts are used. The annual cost is $90,000. The streets are watered in winter as well as in summer, unless it is very cold.

MAKE-BELIEVE HYDROPHOBIA.

The simulating of certain forms of disease and of insanity has been a common "dodge" of conscripts, criminals, and others; but we do not remember to have read of any attempt to pretend hydrophobia except a recent one in England, which one of our exchanges reports as follows: —

A case of hydrophobia caused by the bite of a cat was brought before the notice of the Brighton magistrates on Tuesday last under peculiar circumstances. A man named Hemsley had been locked up on a charge of obtaining a shilling by false pretences, having represented that he was in great trouble, owing to the loss of a relative; but when the charge was called on, the police superintendent informed the Bench that after the man had been placed in the cells his manner became eccentric, and he commenced to bark like a dog. As he got worse, two medical men were sent for, and their opinion was that he was suffering from paroxysms of hydrophobia, and it was ascertained that he had been bitten by a cat some days previously. His removal to the hospital was advised, and thither he was taken strapped to a stretcher, his paroxysms being distressing to witness.

A later number of the same journal contains the following: —

A curious sequel has to be added to the supposed case of hydrophobia from the bite of a cat, in connection with a prisoner charged with obtaining money by false pretences. The man, named Hemsley, had been removed from the cells to the hospital, on the advice of two medical men, one of whom was the police surgeon, their opinion being that he was suffering from the paroxysms of hydrophobia, as he crawled about the floor, barked like a dog, and became furious when any one approached him. His condition was so alarming that a sack had to be thrown over his head before he could be secured and strapped on a stretcher in order to be sent to the hospital. After his arrival there suspicions were aroused as to the genuineness of the paroxysms, and the prisoner was subjected to galvanic shocks. He stood these so well that the operators were puzzled, when, as a sort of final test, one of them said to an attendant, "Take him away; we'll try the 'big' battery to-morrow." This hint of what was yet to come proved a little too much for the prisoner's endurance, and he ultimately confessed that he had been simulating madness. As he had really been bitten by a cat, his trick had been successful in imposing on the police.

METEOROLOGY FOR JANUARY, 1882.

The sum of my observations on the weather for the past month has been as follows: —

Average Thermometer.		Lowest.	Highest.	Range.
At 7 A. M.	20.26°	—15°	48°	63°
At 2 P. M.	30.29°	4°	46°	42°
At 9 P. M.	28.32°	— 3°	42°	45°
Whole month	24.62°	—15°	48°	63°
Second average[1]	24.20°			
Past 19 Januaries	22.80°	12.48° in 1867.	32.98° in 1880.	20.50°

[1] Found by adding the average evenings *twice*.

The average barometer for the month was 29.966 inches, the lowest 29.86, on the morning of the 14th, and the highest 30.55, on the evening of the 24th, a range of 1.19 inches. The average for the past ten years, 29.965. The sum of the daily variations was 12.12 inches, an average daily movement of .391 of an inch, the largest in any one month for the last ten years. On the 13th and 27th they reached .88 and 1.09 inches, in connection with stormy weather.

The face of the sky gave 53 fair observations, 10 cloudy, 16 overcast, 3 rainy, and 11 snowy. The amount of rain, including 33 inches of melted snow, was 5.05 inches. The average amount for the past 14 Januaries is 3.98 inches, the least 1.80 in 1877, and the greatest 7.55 in 1878, a range of 5.75.

The prevailing direction of the wind was west 14° 25′ north, the excess of northerly observations being 17, and the westerly 66. The average direction, approximately, for the past 13 Januaries has been west 18° 45′ north. In only one of these years have the southerly observations (9 in 1870) exceeded the northerly. In 1876 and 1877 they nearly balanced, the excess being only 3 and 2 observations.

It will be noticed that the temperature of the month was nearly 2° above the average, and yet embraced the coldest day (24th) experienced for many years, being an average of four and two thirds degrees below zero through the day; but this again was followed by an opposite extreme, a change in 48 hours of 53°, bringing the warmest days of the month, an average of 42° on the 26th and 27th. In nearly the same time (26th and 27th) the barometrical movement was very great (1.61 of an inch), in

connection with a rainfall of 1.05 inches. The winds also were perhaps equally remarkable for violence, especially on the 22d, 27th, and 29th, doing considerable damage in various localities. These changes in a single week were all unusually large and sudden, the two latter being occasioned, doubtless, by the former, — the heat, — but why there should be this sudden change of heat is a question for philosophy to answer. The snows of the month came in moderate quantities, mostly level, and furnished excellent sleighing nearly all the month, ending in the largest snow-storm of the season, the fall being not less than 12 inches.

AVERAGE YEARLY TEMPERATURE AND BY SEASONS, WITH EXTREMES FOR EIGHTEEN YEARS.

	1.	2.	3.	4.	5.	6.
Years.	Average.	Extremes.	Springs.	Summers.	Autumns.	Winters.
1864	43.78°	—17° to 94°	42.55°	66.81°	42.84°	
1865	46.17	—15 to 96	46.20	68.57	47.89	20.28°
1866	45.25	—22 to 94	42.98	66.76	48.22	24.28
1867	42.73	—15 to 91	40.30	65.60	45.71	21.44
1868	41.85	—20 to 96	39.96	67.35	43.19	16.17
1869	43.12	—18 to 86	38.57	66.74	44.88	22.71
1870	46.10	— 5 to 94	41.76	70.22	48.00	24.31
1871	46.82	—15 to 92	47.68	68.87	48.31	22.51
1872	46.90	— 6 to 95	42.60	71.71	49.73	25.18
1873	46.48	—20 to 93	43.53	68.83	47.84	22.49
1874	47.18	— 5 to 94	43.00	67.81	50.20	28.29
1875	45.15	— 7 to 89	42.15	68.00	47.53	21.85
1876	47.75	— 4 to 90	44.58	71.31	49.05	28.41
1877	49.54	— 2 to 86	45.96	70.57	52.51	24.96
1878	49.57	— 9 to 92	49.09	69.18	52.33	29.45
1879	47.71	— 3 to 92	45.79	68.24	51.34	24.59
1880	49.23	— 3 to 92	48.41	69.72	49.53	31.68
1881	48.52	— 7 to 90	46.50	67.19	53.57	22.82
Average	46.33°	—22° to 96°	43.98°	68.55°	48.48°	24.20°
Highest	49.57		49.09	71.71	53.57	31.68
Lowest	41.85		38.57	65.60	42.84	16.17
Range	7.72	118°	10.52	6.11	10.73	15.51

By the above table will be seen what has been the average temperature for each entire year for the past eighteen years, and for the whole period. The observations are made at 7 A. M. and at 2 and 9 P. M. To procure the above results, the morning, noon, and evening observations of each month are added separately and divided by the number of days in the month, giving 3 averages for the different hours of observation. These three results are then added and divided by three for the average of each month. Again, all the months in the year are added and divided by 12, for the average of each year. Lastly, the 18 years are added into one sum and divided by 18, for the general average. A still closer result may be obtained, as I am informed at the Signal Office in Boston, by adding the evening observations *twice*, with the morning and noon, dividing by four, then by the number of days in the month, and the result will be, within a small fraction of a degree, the same as if taken every hour, night and day, during the month. I have arranged a table showing the differing results for the past two years, estimated on this plan, and find it diminishes the average temperature, as shown in the table given above, less than one half (.465°) of a degree.

From these results, it will be seen that the warmest (1875) and coldest (1868) year of the past 18 have varied 7.72°, while the general average has been 46.33°. The extreme single observations have been —22° (1866) and 96° (1865), giving a range of 118°. The widest yearly range, 116°, was in 1866; the smallest, 84°, in 1877. The extremes of each year are shown in the second column.

The next four columns give the average temperature of each year by seasons, showing that the coldest spring was 38.57° in 1869, and the warmest, 49.09°, in 1878, a range of 10.52°. The general average was 43.98.° The extremes and averages of the other seasons may be seen by the table, without further specification, except to notice that the widest range falls between the summers and winters (9.40°), while the range between the springs and autumns is very small, being only .22 of a degree. I should here add that the winters each fall under two years, including the December of the preceding. By careful study of this table, column by column, we see considerable variety, and yet beautiful harmony in the general results. D. W.

NATICK, *February* 4, 1882.

EDITORIAL NOTES.

THE SCIENTIFIC AMERICAN. — In reading the accounts of the late fire in Park Row, New York, we were sorry to see that our esteemed contemporary, the *Scientific American*, was among the number of the sufferers; but we are gratified to learn that its losses were not so serious as they might have been. The subscription lists, account books, patent records, patent drawings, and correspondence were preserved in massive fire-proof safes. The printing of the *Scientific American* and *Supplement* was done in another building; consequently the types, plates, presses, paper, etc., were unharmed, and no interruption of business was occasioned. The proprietors at once secured new quarters at 261 Broadway, which is every way a change for the better. We congratulate them heartily on their good luck under the circumstances.

THE MACKENZIE VALLEY SCHEME. — In the JOURNAL for January (page 3) we referred to a bold engineering scheme for converting the valley of the Mackenzie River into a great lake, which would make important changes in that section of the continent. We found the account of the project in one of our English exchanges, where the name of its originator was not given. We now learn from Mr. William Weaver, of Nashua, N. H., that he is the author of the plan, which first occurred to him as long ago as 1878. It is said that a party is about to be sent out from London to explore the ground covered by the scheme; and efforts are to be made to interest Congress in the enterprise.

THE KEELY MOTOR. — The stockholders of the Keely motor company have at last lost patience with Keely, and have brought suit to force him to procure patents for his inventions, and to assign them to the company according to agreement. It is no wonder that they begin to feel disgusted. Keely has been "talking big" about his "vaporic powers" and "multiplication" and other mysterious things since 1874, but though he has got over $150,000 from the company on various pretexts he has continually postponed the promised revelation of his vaunted secret. The victims begin to suspect that there is a good deal more "vaporic power" in Keely's gaseous talk than in his machine.

EUCALYPTUS SEEDS. — Dr. D. J. Snyder, of Scio, Ohio, authorizes us to say that he will send seeds of the *Eucalyptus globulus* free by mail to any one desirous of making experiments in the cultivation of the tree. We have no doubt that many of our botanical and other readers will be happy to avail themselves of this generous offer.

SUNDAY LECTURES. — *Le Monileur Scientifique* says that Georges Ville, the distinguished agricultural chemist, has been giving a course of lectures every Sunday, at two P. M., at his experimental farm at Vincennes, near Paris. He has undertaken the cultivation of a plot of 250 hectares, the better to illustrate his system and to show French agriculturists *how to encounter American competition!* The italics are ours.

IN reply to several inquiries, we would say that the address of Dr. C. E. Page, the author of the paper on "The Fasting Cure for Consumption," is Biddeford, Maine.

LITERARY NOTES.

A *Treatise on Chemistry*, by H. E. Roscoe and C. Schorlemmer, vol. iii., Part I., has been received from the American publishers, D. Appleton & Co. The present volume is devoted to organic chemistry, and the portion before us embraces what are usually called the fatty series of alcohols, acids, ethers, etc. The previous volumes have encouraged the chemical student to expect a reliable work, full, accurate, and complete to date. In this he will not be disappointed, for the work before us presents the subject of organic chemistry in a manner heretofore unequalled in the English language and not excelled in any other. The work is not only well written, but handsomely printed on good paper, in large type, and carefully illustrated. Copious references are given at the bottom of the page to the authorities quoted, which greatly increases its value to those engaged in original research, and to the reader who desires more detailed information than is contained in the text.

A second edition of Cairns's *Quantitative Analysis*, revised and edited by Dr. E. Waller, is upon our table. We have already had occasion to recommend this work as a practical guide to the student of quantitative analysis. A few errors found to exist in the former edition have been corrected, some of the processes have been modified as experience indicated, the chapter on the determination of free and albuminoid ammonia has been rewritten, and a chapter added on testing illuminating gas. A new table of atomic weights, prepared by Dr. C. F. Chandler, has also been inserted.

The Photographic Amateur, by J. Traill Taylor, editor of the *Photographic Times* and *American Photographer*, is just the book for amateurs who wish to dabble in this fascinating art. The dry-plate process, now so popular, and so well adapted to the use of tourists and others who are not provided with a dark room, is very fully described. Everything that a beginner needs to know will be found in this little book, unencumbered by a mass of detail, of use only to the practical photographer. It is published by the Scoville Manufacturing Company, New York.

The January number of the *United States Official Postal Guide* is at hand. It makes a book of about 320 pages, containing many features which render it indispensable to all who use the mails, and wish clear and accurate information on postal matters. A new and valuable feature in this number of the Guide is a table giving the time of transit of mails between the larger cities of the United States. It includes points in all the different sections of the country, and is so arranged that the time of transit from any given point to another can be readily ascertained. This table will obviate the necessity of consulting a multitude of railway guides for the same purpose, thus saving a deal of valuable time for those who make use of it. It is published by Houghton, Mifflin & Co.

The *Half-Yearly Compendium of Medical Science*, Part 29, for January, 1882, is received. It is edited by Dr. D. G. Brinton, Philadelphia, and contains 280 pages of valuable matter in various branches of medicine.

Full of useful information comes the *American Agriculturist* for February 1st, with 34 double quarto pages of instructive reading matter and about 70 engravings. A special feature of this number is the 16 columns of particular information to meet the wants of all intending to go West or invest there.

The *American Medical Digest* is the name of a new monthly edited by Dr. John C. Lester, A. M., New York.

Common Minerals and Rocks, by William O. Crosby, forms No. 12 of the Guides for Science Teaching, issued by the Boston Society of Natural History. It gives in the brief limits of 140 pages a clear description of the forces that are and have been acting upon the earth's surface and the various effects which they produce, the different kinds of rocks and rock-structures thus formed. The commoner minerals are briefly described, and the composition of the rocks into which they enter. The system of classification is that employed in the collections of the society. Ginn, Heath & Co., Boston, are the publishers.

The *International Scientists' Directory* is compiled by Samuel E. Casino, of this city. For several years past Mr. Casino has issued a directory of American scientists, which has proved of great assistance to those who have specimens to exchange or wish to correspond with others in their own profession. This year Mr. Casino has enlarged his plans so as to include Europe, Asia, Africa, and Oceanica. The result is a handy volume of nearly 400 pages, and containing not far from two thousand names and addresses, in which we note very few errors.

Measure for Measure and the *Merry Wives of Windsor* have been added to Mr. Rolfe's edition of Shakespeare, which is now rapidly approaching completion.

We are indebted to Messrs. E. and F. N. Spon for a copy of *A Pocket-Book for Chemists, Dyers, Brewers, Photographers, Students, etc.*, by Thomas Bayley, Assoc. R. C. Sc. I., second edition, with additions. Although rather large for the average pocket, being a book of 437 pages, it is one of the most convenient reference books in the English language for practical laboratory work. The usual analytical tables are given, together with tables showing the strength of various solutions; the percentage of alcohol, ether, acids, and alkalies, corresponding to different densities; Clerget's table for the saccharimeter; specific gravity and solubility of ordinary substances; Mendelejeff's classification; Allen's formulæ for alcohol, beer, and wort; table showing the composition of tallow by the fusion point; tables for the preparation of solutions used in volumetric analysis; and many others. The book is at once complete, handy, useful, and apparently accurate.

Medicine and Pharmacy.

ARTIFICIAL QUININE.

It has long been a favorite subject for discussion, among chemists, whether quinine will ever be made synthetically. After each new victory of the synthetical chemist this old question is revived and rediscussed. Many attempts have been made to settle it, and some of them, although they did not lead to the desired end, have been productive of valuable results in some other direction. Perkin, in an attempt to make quinine from aniline, made the first aniline dye, — mauveine.

Recently the problem has attracted increased attention, and from time to time the assertion has been made that it had been solved, and that the methods would be made public as soon as the necessary patents had been taken out to protect the discoverer. Next we were told that the substance which was to pass for artificial quinine was not identical with it, but resembled it closely and had the same therapeutical effects. The new quinine is probably *chinoline*, which has recently been prepared synthetically by a new process, and a brief sketch of its history and properties is particularly appropriate at this time, especially as a strong effort is being made to introduce it into medicine as a cheap and agreeable substitute for quinine.

In 1842 Gerhardt obtained a new base by distilling quinine and other alkaloids with potash, and gave to it the name of *quinoleine*. A few years later A. W. Hofmann showed that quinoleine was identical with one of the bases which Runge had discovered in coal-tar, and to which the latter had given the name of *leucol*. Laurent afterwards found that Gerhardt's quinoleine was not perfectly pure, and Williams doubted its absolute identity with leucol. In 1880 Skraup succeeded in making chinoline, as it is now called, by heating a mixture of aniline oil, nitro-benzole, and glycerine with sulphuric acid. This seems to have been the reason why attention was directed anew to this long but imperfectly known substance.

Chinoline is an oily liquid, of strong refractive power, and possessing a peculiar odor. It boils at 228° C. (442° F.), and when freshly prepared is colorless, but soon darkens like aniline, without undergoing any chemical change. The free base is not soluble in water, but dissolves readily in alcohol, ether, chloroform, benzole, etc. Its salts are deliquescent and difficult to crystallize, with the exception of the tartrate. This salt has a faint odor of bitter almonds and a burning taste like peppermint water.

Donath has studied its antiseptic and physiological properties with extreme care and thoroughness. He finds that chinoline has distinct antiseptic, antizymotic, and antipyretic properties: in 0.2 per cent. solutions, it prevents the putrefaction of urine, of glue, and the lactic acid fermentation; in 0.4 per cent. solution, it arrests completely the putrefaction of the blood, and hinders in the highest degree the coagulation of milk; and, finally, in 1 per cent. solution, it prevents the coagulation of the blood. Numerous experiments upon healthy as well as sick persons have shown that chinoline in large doses (15 to 30 grains per day) can be taken without injury. Most of the experiments made with tartrate of chinoline in malarial diseases, intermittent fevers of different types and duration, intermittent neuralgia, and similar complaints are reported as having been satisfactory. None of the inconveniences attendant upon the use of quinine, such as ringing in the ears, dizziness, and loss of hearing, are noticed with chinoline. Dr. Loewy reported over forty successful cases in the *Vienna Medical Press*. Dr. Sakowsky, in St. Petersburg, also gives a favorable report in regard to it. We hope soon to hear what success has attended its use in this country, but at the same time we advise great caution in using it until its action and properties are better understood than at present.

TREATMENT OF NERVOUS AND NEURALGIC HEADACHE.

The *British Medical Journal* reports an interesting lecture on the treatment of the different forms of nervous and neuralgic headache, by Dr. W. H. Day, of London. We condense for our readers the portion referring to the action of the chief remedies commended: —

Bromide of potassium is a valuable remedy, and many a headache is kept in check, and the seizure cut short, if a full dose be taken as soon as discomfort is felt, particularly if the patient can go to bed and obtain sleep. Again, if compelled to keep about, twenty grains taken in a little sal volatile and water will lull the nervous centres, and so calm the cerebral circulation; or ten-grain doses with carbonate of ammonia in effervescence with citric acid will sometimes have an equally good effect. Many persons never undertake a journey without being provided with this remedy, and with it they can travel the whole day and wake next morning perfectly free from headache or nervous disturbance. I have never known any ill-effects to ensue from the administration of the bromide, and I have given it in considerable doses for a long time together.

Bromide of ammonium sometimes exerts an excellent effect upon nervous headache, relieving it, in fact, when the potassium salt fails. I generally give it with a few drops of sal volatile in a wineglassful of water on first awaking in the morning, before the patient gets up, and in this way a mild form of headache is kept at bay. The remedy would be altogether useless in a severe form.

Hydrate of chloral is a popular and excellent drug. When an attack is threatening, and the patient knows that unless sleep can be procured at once he is doomed to many hours of misery, a full dose will rest the brain and control the hyperæmic condition, upon which, in a great measure, the pain depends. Excitement of the cerebral circulation, flushing of the face, and fullness of the pulse are the chief indications which justify its exhibition. The brain is certain to become weakened and the mental functions impaired if a person acquires the habit of taking the drug for any lengthened period. Occasionally taken at the onset of a headache, or when the patient is nearly worn out with suffering, it is most valuable; but indiscriminately resorted to, the patient is certain to pave the way to mischief in the brain and nervous centres. The best chance of its doing good is to give it when the patient feels an approaching seizure; for, if the pain has reached an acute stage, it will repeatedly cause nausea and vomiting, and then several doses may be taken with an increase of suffering rather than any abatement of it.

Croton-chloral in some forms of nervous and neuralgic headache is a most useful remedy. In doses of from five to ten grains it will relieve pain and procure sleep, but if there be any nausea present the tendency is to increase it. The dose must be varied, according to the circumstances of each case, delicate, nervous women being affected by a small dose, whilst strong people require a larger quantity. I begin with five grains in a little syrup and water at night, and if this has no effect in an hour, then I repeat the dose. As a rule, I have given ten grains for a dose at bed-time, but this has not in all cases procured sleep. The symptoms occasioned by an overdose are similar to those of chloral hydrate.

Arsenic is a remedy of the greatest utility in neuralgic and periodic headache. I have generally combined it with iron or quinine, according to circumstances. It is one of the remedies that ought to be continued long enough to produce its specific effects.

Some cases of neuralgic headache have yielded to a combination of bromide of potassium, quinine, and arsenic, when none of them alone brought any relief. Arsenic is especially serviceable in depressed states of the nervous system; neuralgic headache, like neuralgia generally, indicates lowered vitality, and for this arsenic is a valuable remedy, by giving a stimulus to the vital forces. Again, in all cases of neuralgic headache associated with eczema or psoriasis, or the absorption of miasmata, arsenic is very serviceable, and should be given till its specific effects are produced. Granules of arsenious acid (gr. 1-66th) are a very good form of administration. One may be given twice a day after food.

Quinine is a remedy well known and generally administered. Frontal headache is rarely relieved by it, unless it is paroxysmal, and resembles the neuralgic form in other respects. If the pain originates from disorder of the digestive apparatus, or if it be due to sympathetic disturbance in some other organ of the body, then quinine will aggravate the suffering; but if the attack is purely neurosal, if one-sided, or even if it seize the occiput, the remedy will be found of service. Five grains dropped on a little plain water, and instantly swallowed, may be given for a dose when the pain affects one side of the head and face. This dose may be repeated every hour, till the suffering subsides. Sometimes a single dose will take away the pain in a few minutes. After this, drachm doses of the tincture of quinine with ten minims of spirit of chloroform will be found very serviceable, and may be continued for some days.

Iron, from its direct action on the blood, and its power to remove anæmia, is of great value in nervous and neuralgic headache. When the pathological change in the brain is one of anæmia, and the ganglionic cells are disturbed there, some soluble preparation of iron will be needed. Those that are the least astringent and stimulating are to be preferred. The preparation I have most frequently used is the ammonio-citrate of iron, in five-grain doses, given three times a day, combining it with bromide of ammonium, or with arsenic where the headache is one-sided. Dialysed iron is an excellent preparation, and I have often employed it successfully in the case of children. The syrup of the hypophosphite, occasionally combined with ten-grain doses of bromide of potassium, is well borne in many cases of nervous headache.

Phosphorus may be often given with advantage in some forms of nervous and neuralgic headache. It acts as a general tonic to the nerve-centres, and is undoubtedly of value when the nervous system is exhausted from any cause. The phosphorus *perles* are the best form of administration. The drug should be commenced in small doses (gr. 1-60th) directly after food, and be gradually increased to gr. 1-30th daily, or even twice a day. I never exceed this dose. It should only be given in the intervals of the headache due to nerve exhaustion, and it is useless if there is nausea, or a seizure is coming on.

Gelseminum will occasionally relieve a neuralgic headache when the bromides and quinine fail. It

is important to begin with a small dose, say five minims of the tincture, as a case is recorded where ten minims, followed in half an hour by a repetition of the same dose, produced drowsiness, shivering, frontal headache, dizziness, and symptoms of collapse.

Tea, as a rule, should be prohibited to the victims of nervous headache. It is certain to be productive of evil when the nervous system is reduced in strength. In one person a severe nervous headache will vanish quickly on taking a strong cup of tea, and in another it will increase the headache by causing severe nausea or vomiting.

Coffee will ward off an attack in some persons by acting as a powerful stimulant or as a brisk aperient. If in persons of delicate constitution we can encourage the consumption of the purest and the lightest cocoa or chocolate well prepared, and give it when the stomach is at its strongest, in the absence of headache, we shall strike at the origin of the evil by conveying into the system a large amount of nourishment, which exercises a most salutary effect on the nervous system.

The therapeutic action of *caffeine* is like that of strong coffee. It is a stimulant to the brain and nervous system, augmenting reflex action, increasing the frequency of the pulse, and removing the sensation of fatigue. A moderate nervous headache arising from exhaustion will often yield to it at once. From one to four grains of citrate of caffeine is the proper dose.

I think it is very questionable whether there is any headache benefited by *alcohol*, except that which attacks one side of the cranium. When the headache is not of this character I rarely prescribe a stimulant. It is wiser and safer to assume that the cause is rather within the reach of good food, rest, tonics, and change of air than that of alcohol in any form. I am in possession of data to justify the opinion that these nervous headaches have been kept at bay by relinquishing stimulants altogether, and following a strictly careful and temperate diet. So many sufferers from headache have feeble digestive power, through their anæmic or debilitated condition, that they falsely imagine stimulants compensate for the scanty food which they consume, taking wine or brandy habitually, from which they derive passing relief. If alcohol occasions a degree of excitement in the system, so as to induce heat of surface, a quickened pulse, and flushing of the face, then it has been carried too far, and there is every chance that the patient will pass a night of discomfort, and the next morning will find him a sufferer.

POISONING BY RESORCINE.

In the May number of the JOURNAL we described the preparation of resorcine, and stated that it was not dangerous in moderate doses. Dr. William Murrell describes a case where a dose of two drachms (about 8 grams) produced very alarming symptoms, resembling carbolic acid poisoning. Dr. Jessop was at once sent for, and found the patient insensible, in a profuse perspiration, groaning, pallid, lips blanched, tongue dry, conjunctivæ insensible to touch; teeth clenched; skin cold and clammy, and temperature evidently low. Very little air was found to be entering the lungs; no rhonchus; heart sounds very faint, and heard with difficulty. Two ounces of olive oil were poured down her throat, the stomach was subsequently emptied and washed by the aid of the stomach-pump, and in two hours she became conscious. Brandy and nitrite of amyl were administered as consciousness returned, and the temperature gradually rose to the normal. Dr. Murrell believes that if the condition of collapse continue it would be advisable to administer a hypodermic injection of atropia. Dr. Andeer considers that albuminate of iron and red wine are the best antidotes in resorcine poisoning. With regard to the dose, he says that he has often given 40 grains every four hours without the production of any unpleasant symptoms.

PERMANGANATE OF POTASH IN SNAKE-BITES.

M. de Lacerda has lately discovered a fact of considerable scientific and practical importance, which he has communicated in a note to the Paris Academy, namely, that permanganate of potassium counteracts very effectively the poison of snakes. In a first series of experiments, a water solution of the poison was injected into the cellular tissue of dogs, under the legs, and its usual effects were large swellings, with abscesses, loss of substance, and destruction of tissues. But when an equal quantity of filtered (one per cent.) solution of permanganate of potassium was injected one or two minutes after the poison, these local injuries were quite obviated; there was merely a slight swelling where the syringe had entered. Next, introduction into the veins was tried, and the permanganate again succeeded admirably. In only two cases out of more than thirty was there failure, and this is attributed to the animals experimented on being very young and weak, and badly fed; also to the antidote being administered at too long an interval after the poison, when the heart was already tending to stop. In one series of cases the permanganate solution was introduced half a minute after the solution of venom, and the animal operated on showed no derangement beyond a very transient agitation, and acceleration of the heart's action for a few minutes. In another series, the characteristic troubles caused by the poison were allowed to manifest themselves (dilatation of the pupil, quick breathing and heart action, contractions, etc.) before the antidote was applied. In two or three minutes, sometimes five, the troubles disappeared; a slight general prostration followed for fifteen to twenty-five minutes, after which the animal would walk, and even run about, and resume its normal aspect. Other dogs, poisoned similarly, but not receiving the antidote, died more or less quickly.

THERAPEUTICAL HINTS.

Grindelia Robusta in Asthma. — In a paper read before the King's County Medical Society, Dr. T. M. Rochester said that he had used the drug in over sixty cases of asthma. In all of these it produced relief. Sometimes this was permanent; very often it lasted for a long time. It always did some good. It seemed to act equally well in inflammatory and simple spasmodic asthma. Even in cardiac asthma, combined with other drugs, the best results were obtained. It is useful both in the attack and during the interval to ward off future attacks, but especially for the latter purpose. For the attacks, half-drachm doses of the fluid extract are to be given every fifteen minutes until relief is obtained. In the interval it may be given in fifteen to twenty drop doses every four or six hours. This should be continued for from a week to ten days, when, except in very obstinate cases, the patient will experience relief for a period of six or eight months, or longer.

In addition to this testimony, we find in the *Therapeutic Gazette* a report on the use of the drug at the United States Marine Hospital at Portland, Me. Dr. Berry, acting assistant surgeon, says that the remedy was found very efficient in relieving attacks of asthma.

The Use of Hot Water in the Local Treatment of Diseases of the Eye. — In a communication to the *American Journal of the Medical Sciences* Dr. Leartus Connor speaks very highly of the frequent local application of hot water to the eye in cases of acute conjunctivitis and blepharitis, and also in chronic hyperæmia, granular inflammations, iritis, and corneal affections, in which he has used it with great success. The water must be as hot as the patient can comfortably bear with his hand. The patient leans over the basin and throws the water against the eye for a few minutes, three or more times a day, according to the case.

A Remedy for Toothache. — Dr. F. P. Atkinson describes in the London *Practitioner* a novel form of treatment for toothache, to which he was led by Dr. Murrell's results with nitro-glycerine in angina pectoris. Being afflicted with severe toothache, and proceeding on the similarity in effect following the employment of nitro-glycerine and nitrite of amyl, he applied to the aching tooth cotton wool saturated with Richardson's compound anæsthetic ether, which contains the nitrite. Instant relief ensued, which was maintained for four hours by a pledget of wool previously soaked in laudanum. Dr. Atkinson adds that a one per cent. solution of nitro-glycerine has the same effect in stopping pains as nitrite of amyl; and thus a means of relieving a most distressing complaint is opened up.

Pulmonary Gymnastics. — Dr. D. F. Powell, of La Crosse, Wis., writes to the *New York Medical Record* as follows: "Ten years ago my chest measurement during full-forced inspiration was thirty-seven inches. By systematically inhaling and distending the air-cells as recommended by Niemeyer (and Smith, in the *Record* of October 29, 1881), I have increased chest measurement to forty-four inches, and have wonderfully developed the pectoral and intercostal muscles. I write this to warn those who may adopt pulmonary gymnastics against inspiring air at too low a temperature, as I have on several occasions suffered from acute bronchitis, brought on by the forced inhalation of 'raw' cold air. I find that deep inspirations of pure air, at a temperature of from 60° to 80°, are of marked benefit in nearly all incipient lung diseases. I also freely use air medicated with carbolic acid, tar, iodine, bromine, nitrate of potash, etc., as indicated, and believe that no other treatment equals it as a remedial agent."

Whooping-Cough in the Gas-House. — In France it is an old woman's remedy to conduct children suffering from whooping-cough to breathe the air in a refining chamber of a gas factory. The inspiration of gas was never known to do good, and Dr. Poincare now asserts that after numerous experiments on animals he found their lungs had profoundly altered by breathing coal gas; that granulations were produced.

Pepsine for Sea-Sickness. — Dr. Finzelberg reports excellent success from the use of pepsine and hydrochloric acid as preventive of sea-sickness. As much pepsine as will lay on the point of a knife is mixed with five drops of hydrochloric acid, and enough water added to give it a pleasant acid taste like lemonade. It is taken after the meal or at other times.

Administration of Tannin. — This valuable astringent often yields unsatisfactory result when administered in powder or simple solution, either failing of effect, or producing pain and other signs of irritation of the stomach or intestines. We note in a German exchange that at the Leipzig Policlinik all these unpleasant results are avoided, and a very useful and agreeable astringent mixture, well suited to children, is prepared by forming an albuminate of tannin, according to the following formula: —

℞ Tannic acid . . . . . 2 parts.
Water, ~
Solution of one white of egg . . ää 100 parts.

The last is to be added while stirring briskly.

MISCELLANEA AND FACETIÆ.

A Holy Well. — Professor Frankland writes as follows to the London *Times* concerning a well considered sacred by Mohammedans: "The well is in Mecca; the water is regarded as holy, and large quantities are annually sent as gifts to all Mussulman countries. Most of the Mohammedan princes, especially those of India, have 'keepers of the well,' whose duty it is to send them annually water from it. I have analyzed this water, and find it to be of the most abominable character. In fact, it is sewage more than seven times as concentrated as London sewage, and it contains no less than 579 grains of solid matter per gallon. Knowing the composition of this water, and the mode of propagation of Asiatic cholera by excrementitious matters, it is not to be wondered at that outbreaks of this disease should often occur among pilgrims to Mecca, while it would scarcely be possible to provide a more effective means for the distribution of cholera poison throughout Mohammedan countries."

Mr. Holloway's Charities. — The London *Chemist and Druggist* says: That portion of the public which has spent money for Mr. Holloway's pills or ointment can at least have the satisfaction of knowing that good use has come of their investments. It is well known that Mr. Holloway has erected and endowed in the neighborhood of Virginia Water two large and handsome buildings, one designed as an institution for persons of the income-earning classes when afflicted with mental diseases, and the other in memory of his wife, as a college for the higher education of women. The total cost of the gifts which Mr. Holloway thus proposes to make to the nation amounts to the mighty sum of £950,000 (or nearly five millions of dollars). That includes costs of the freeholds, buildings, and endowments. In the college he has recently placed some of the most beautiful of modern pictures, which have been bought at a cost of over £32,000 ($160,000).

Mosquitoes and Bedbugs in Medicine. — A writer in the Dallas *Herald* states that he has actually obtained quinine by macerating mosquitoes in a mortar with alcohol, and hence he thinks the mosquito is nature's specific against malaria, as they occur together, usually. He also thinks that bedbugs or chinches furnish an antidote against rheumatism. He deduces this from the premises that corrosive sublimate will kill bedbugs, and that the formation of corrosive sublimate in the system of calomel takers will cause articular rheumatism; hence all a rheumatic has to do to be cured is to get well bitten by the pretty little housebugs, which will hereafter, perhaps, be cultivated instead of leeches.

Selection of the Weakest. — At a French matrimonial agency office: "Oh yes, sir, we have what you want, — an orphan of about twenty years of age." "Very good. Is she pretty?" "Not particularly, but she has a fortune of 500,000 f. And, besides, she is consumptive." "Consumptive! Are you quite sure of that?" "Oh, certainly, sir; we guarantee it."

Californian Pharmacy. — According to the *Pacific Medical and Surgical Reporter*, a practitioner of Alameda County, California, found at the bedside of a patient a genuine pot of bullfrog ointment, which was described as being "the best thing in the world for sore breasts," for which purpose it was being used. This valuable and elegant remedy is made by bringing one pint of milk to a boiling temperature, throwing into it a live bullfrog, and boiling down to a paste, straining out the bones.

The Future of Inoculation. — This is from *Punch:* Customer: "My nephew is just starting for Sierra Leone, and I thought I could not make him a more useful present than a dose of your best yellow fever. Would you tell me the price, please?" Chemist: "Well, ma'am, the germs are so difficult to cultivate in Europe that I would advise your waiting for the next West Indian mail, when I am expecting a nice fresh consignment from St. Thomas. Meanwhile, we would recommend our half-guinea traveller's assortment of the six commonest zymotics, and could add most of the tropical diseases from stock at five shillings each. We have some nice Asiastic cholera, just ripe, but they are more expensive."

Where Ignorance is Bliss. — A French physician, having taken an overdose of Baumé's Bitter Drops, which contain nux vomica, rushed to the Codex to ascertain how much of the poisonous alkaloids he had taken; and, not finding the desired information there, he remarked, "This preparation is a medicament which we doctors have the stupidity to give to our patients, and even to ourselves, without knowing what it contains." This applies to many other preparations beside the Bitter Drops.

SELECT FORMULÆ.

Aloetic Pills. — Dr. V. Androul, in the *Répertoire de Pharmacie*, calls attention to the disagreeable effects of the ordinary preparations of aloes, owing to the fact that the irritating aloes are combined with other almost equally irritating drugs, and recommends the following formula for an aloetic pill, which, he says, has given uniformly good results. In it the harshness of the aloes is mitigated by the soap and gum arabic, while its cathartic action is not interfered with, and is rather assisted by the cream of tartar. The doctor's recipe is as follows: —

	Grams.
Pulv. aloes cap.	2
Crem. tartar.	2
Sapon. ol. amygd.	4
Pulv. gummi arab.	2
Syr. sacchar.	gtt. 5

The powders are to be mixed with the soap by the aid of heat, and the syrup added to make a mass. The quantity specified is calculated to make 100 pills.

Neuralgia, or Rheumatism. — The *Quarterly Epitome* gives the following: —

Chloroform,	
Tinct. aconite rad.	āā f. ʒij.
Morph. sulph.	gr. i.
Iodide potass.	ʒj. M.

Prick the skin with a fine needle, over the seat of pain, with twenty or thirty punctures, and rub in the foregoing mixture. Immediate relief is said to follow each application, and a cure effected in local cases in a short time.

Snuff for Coryza. — Mix the following: —

Subnitrate of bismuth	3 drachms.
Powdered acacia	1 drachm.
Muriate of morphia	1 grain.

Orange and Lemon Syrups. — Mr. Fairthorne, in the *Journal of Pharmacy*, recommends the following process for producing fine flavoring syrups: Take the peels of six oranges or lemons, cut them very thin, make a tincture by macerating in 6 fluid oz. alcohol for three days. Filter and pour on 1 lb. (avoird.) sugar, and allow the alcohol to evaporate spontaneously. When dry dissolve in ½ pint of water, in which (in the case of orange syrup) 1⅓ oz. citric acid or (in the case of lemon syrup) 2¼ oz. citric acid has been previously dissolved. This mixture is added to 11 pints of simple syrup.

Red Indelible Ink. — According to *New Remedies*, this may be made by dissolving 1 part of platinic chloride (platinum tetrachloride, formerly named "bichloride of platinum," commonly used as a reagent) in 6 parts of water. Write with this solution upon the fabrics, which must have been previously sized with a thin solution of gelatine or dextrine, and then dried and ironed. After the writing has become dry a dilute solution of iodide of potassium is brushed over the marks.

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GOOD WORDS FOR ADVERTISERS.

We would call the attention of our medical friends to Messrs. Berge's advertisement of their new Holtz machines. Messrs. Berge are successors to Hall & Benjamin, whose reputation for good workmanship is well known.

Hoopes, Brother & Thomas, Florists, on page 5, send their annual announcement, and are desirous of supplying their old customers, and such new ones as may be attracted by their advertisement, with desirable collections of choice plants.

The Stylographic Pen Co. have been in our columns for some time, and have always proved themselves to be perfectly reliable. They have made a new departure in prices at a low figure, to compete with the great number of cheap articles now in the market. The quality of their goods still keep up to the original standard.

The *Sweet Things* of this life are illustrated on page 2 in the advertisement of Messrs. Mellor & Rittenhouse, of Philadelphia, manufacturers of licorice. They are among the largest manufacturers of this great staple in the country, and their products compare favorably with the best of foreign make. A visit to their establishment in Philadelphia a few weeks since fully confirmed us in our previous opinion of the firm, that they were willing and able to perform all that they promised.

Tourjee's Trips to Europe have become an annual necessity to musical people, teachers and others, and it is only needed for us to call attention to the fact that on page 5 of our present issue can be found an advertisement setting forth that an excursion for the coming season is being planned to accommodate those who desire to join one of these very desirable parties.

Morning, noon, and night the pens of the Esterbrook Steel Pen Company are silently but surely accomplishing their purpose.

Do not be prejudiced, but try a box of Cephaline if you wish to be cured of headaches.

GOOD WORDS FROM SUBSCRIBERS.

Henry, Ill., *Jan.* 16, 1882.

Journal of Chemistry:

Gents, — I cannot get along without the Journal. Think I shall become a *life member*. Have taken it ever since its publication. Henry Reader.

Ewingsville, N. J., *Dec.* 26, 1881.

I have been much interested in the Journal since taking it. Several years have gone since the first number came to hand. I am a farmer, and of course the agricultural department receives my attention. I am glad that the editors are discussing some of the matters of farm management. The farm ought to be a mine of intellectual wealth as well as contribute to the physical demands of the toiler. Chemistry has given an additional interest to the occupation. E. W. Lanning.

Washington, D. C., *Jan.* 17, 1882.

Journal of Chemistry Co.:

Gentlemen, — I should miss the Journal very much were I to discontinue it. It grows better with each year. Wishing you a "Happy New Year," I remain,

Yours, C. A. Burghardt, M D.

Boston Journal of Chemistry
AND
POPULAR SCIENCE REVIEW.

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Familiar Science.

WHAT ARE FALLACIES?

A FALLACY is defined to be a deceptive view or belief, that which misleads the eye or the mind, that which is sophistical or erroneous. As thus defined it seems easy to comprehend the nature of fallacies, and to point them out as they come under the observation of normal or healthy minds. Every thoughtful, intelligent man or woman feels competent to decide as to what is or what is not fallacious, and this independent judgment is constantly exercised by individuals in every community. Not only do we assume to be equal to the task of pointing out fallacies, but the inclination exists to combat them, and nearly every one living in civilized society is engaged in a warfare of this nature. It is not only carried on in states, cities, and neighborhoods, but the sacred precinct of home is invaded, and the domestic relationships are disturbed by it. Fallacies in religion, morals, politics, medicine, finance, education, etc., are widespread evils, and receive attention from rulers, legislative bodies, and magistrates, but there are those which exist in narrower circles. The husband discovers fallacies in the mind and conduct of his wife, and the wife in the husband, and the parents in their children; in brief, fallacies exist everywhere, and dominate in all the relations of life.

It is fortunate, living as we do under the control of baneful fallacies, that there is always *one* who is free from their pernicious influence, and that happens to be the individual who is able to discover them in others. None have been found willing to acknowledge themselves as cherishing fallacies, and few who were not certain they were disastrously influencing the lives and conduct of their neighbors and friends. In politics, the Whig rails at the fallacies of the Tory, the Republican at those of the Democrat, and *vice versa*; in religion, the Catholic believes in the infallibility of his Holiness the Pope, while the Protestant regards him as a weak old man, the impersonation of very silly fallacies. In medicine, the allopathist taunts the homœopathist, and the latter in turn jeers at the former. In science, the Darwinian holds in contempt the views of the old school scientists; and the latter are positive that no more fantastic notions could be held by sane men than those held by the disciples of Darwin; and so the cross-fire is maintained in every direction in which human thought is permitted to go. If everybody regards everybody but himself as the victim of delusions, does not this prove that we do not know what a fallacy is?

However certain it may be that no one is competent to decide what are or what are not fallacies, it is equally certain that there are wise men, philosophers, to whom the world looks for correct answers to all troublesome questions. Let us consider for a moment the qualifications of these philosophers. It is true they are wise, learned, acute, experienced, but they are not gods. Men wise in the world's esteem are too often like the fair, round apple on the high bough of the farmer's tree reserved for exhibition at the horticultural show. The fruit seems perfect at a distance, but when plucked a worm-hole is found on the under side. Great men nearly all have worm-holes in the brain, and not all of them are covered with the fragment of a leaf, after the fashion of the work of the apple-worm. Men's minds to a large extent resemble the dwellings in which they live. The abodes of the lowly and the poor are but single-room structures, without furniture except that most needful, and destitute of all embellishment; those of a higher class have more furniture and more embellishment, but it is fantastic and incongruous. Those of the highest class, the learned, the wealthy, and the great, live in houses with elegant and imposing exteriors, but within there are rubbish rooms, and numerous cavities left by the carpenter and mason, littered with shavings, sawdust, mortar, and hidden from sight by the garnished walls. There are rubbish rooms in the brains of the learned and great, and numerous cavities littered with whims and fancies, which if the world could but discern would be labelled as fallacies. It may be regarded as a misfortune, but it is true, that we have no man or class of men who can be trusted to detect and expose errors. For some wise reason, doubtless, the human intellect has in no instance been made clear enough to discern positively between good and evil, what is true and what is false; a common weakness, common imperfections, link all together, and no one can satisfactorily answer all the questions of life. As it is impossible for individuals of the race to know each other, it is clear that delusions will exist regarding each other's mental capabilities and powers. Learning enlarges the scope of the mind, expands its boundaries, clears away mists and clouds, gives better balance to the judgment and clearness to the discerning faculties; but it does not raise one above the human horizon, or remove human fallibility. True piety, genuine, honest religious conviction, does much to purify thought and elevate the intellect, but it is apt to fasten upon the mind absurd dogmas and sect prejudices, which greatly trouble the individual and the world. A theologian must of necessity belong to a sect, the tenets of which, however preposterous, he must acquiesce in, and when church dogmas are once allowed to fasten themselves upon the mind, the door is open for the entrance of vagaries and fallacies which can only be treated with derision by those who consider them from an independent outside standpoint.

Science has long been supposed to be a rock by which all fallacies may be ground to powder if they but fall under its crushing weight. Science has great advantages, and great power; it weighs in its balances not only the earth on which we live, but solar systems, and almost the siderial universe. It rests its claims on analysis and fact, and mathematics is its handmaid; but there are weaknesses in its walls, and none of its builders can finish more than a small portion of the structure. Outside of special work, which may be gigantic in its nature, the workmen are often distinguished only for weaknesses which border upon puerility. The human mind is so constituted, as has been intimated, that it may master the most sublime facts and principles in nature, and yet be so weak in its ordinary deductions and in practical wisdom as to excite the derision of a school-boy. We cannot safely trust the workers in laboratories, or the night watchers in observatories, to decide for us all of life's problems, or to settle for us what are or what are not fallacies. Science is indeed a rock, and on it are laid the solid foundations of all the great discoveries in nature, but however disappointing and vexing it may be to our pride, it must be confessed that the rock, in those parts which bear upon some of the vital questions which divide the known from the unknown, is so honeycombed with dissension and doubt that the world's controlling fallacies suffer little disintegration or detriment when subjected to its pressure.

There is no supposed fallacy more firmly intrenched in the belief of millions than that which is known in modern times as Spiritualism. It has been and is regarded by other millions as a belief insulting to common sense, gross and impossible in its claims and pretensions, a cheat and a fraud. A fallacy trembling under such an indictment as this ought to be easily crushed if given over into the hands of science for treatment; but science has utterly failed to convince the world that it is a fallacy, and it has not explained the alleged phenomena by any satisfac-

tory facts or theories. On the other hand, the fallacy has to a considerable extent conquered science; and to-day it is adopted as truth by a large number of the most accomplished students in science whom the world recognizes. Here we have a striking example of a dispute over an alleged fallacy, in the ranks of science, which illustrates its inadequacy to decide what is truth and what is error, what is false and what is veritable. Science has no methods to disprove it; prejudice, anger, hate, will not accomplish any good end; if they could, desirable results would have been reached long ago. The outcome of the scientific contest with the belief proves one of two things: either it is no fallacy, or it is one capable of inoculating its sturdiest enemies with its virus when brought into the laboratory for investigation.

Psychological science, if there be a science worthy of such a designation, is specially incumbered with difficulties. Its province is to arrange and methodize the facts connected with mental phenomena and evolutions, and in this field the mind of the investigator is liable to fall into errors and delusions of greater magnitude perhaps than those under analysis. As human nature is constituted, a diseased mental organism is of necessity called to judge the nature of like diseases in others, and this bars the way to fair trustworthy investigation.

COMETS AND METEORS.

I.

TIME was when comets were believed to be the precursors of disaster to nations or their rulers. It is not to be wondered at that when the movements and positions of the familiar planets were supposed to have an influence on human destiny, the sudden advent of these strange and striking apparitions in the heavens should have been imagined to have unusual and fearful significance, and that scholars and philosophers looked upon them with no less dread than did the untaught vulgar. The simile of Milton expresses alike the popular and the scientific opinion of these startling phenomena, which he not unnaturally associates with the arch-fiend of his great poem: —

> "Satan stood
> Unterrified, and like a comet burned,
> That fires the length of Ophiuchus huge
> In the arctic sky, and from his horrid hair
> Shakes pestilence and war."

The great comet of 1680, by the study of whose motions Newton proved that these bodies obey the force of gravity, was the object of much superstitious terror, and of curious theological speculation withal. Whiston, accepting the calculated period of 575 years for the comet, reckoned that one of its earlier appearances must have occurred at the date of the Flood, which he supposed to have been caused by its near approach to the earth; and he imagined that the final conflagration of all things was to be brought about by some future encounter with the same unlucky visitant. As late as 1811 the brilliant comet of that year was generally regarded in Russia as presaging the invasion of Napoleon, and it caused no small panic among the common people in other parts of Europe.

The delineations of some of the earlier comets show how the superstitious fancies of observers affected their very powers of vision. Some of these pictures represent comets as having most fantastic and preposterous forms, — flaming swords, with well-defined hilts, fiery spears, and the like. A comet endowed with any sense of the ludicrous would shake its horrid hair with uncontrollable laughter at such caricatures of its physiognomy.

Modern science has dispelled the old-time apprehensions of mischief from comets, though now and then some theorist of an imaginative turn, or possibly with a touch of ancestral superstition in his make-up, indulges in speculations as to the possibility of a collision between our steady-going planet and one of these long-tailed stragglers of the sky that rush across her airy track without regard to the fixed time-table of her annual trips; or he predicts (as Mr. Proctor was lately reported to have done, though we believe on no good authority) that we dwellers on the earth may indirectly suffer from the excessive heat liable to be caused by the plunging of one of these erratic bodies into the sun. It may safely be said that what we know of comets does not justify these fears; and what we do *not* know, however freely we may speculate upon it, can hardly be made the basis of definite predictions.

What *do* we really know about comets? Not so very much compared with what we do not know, and yet a good deal considering the difficulties that beset the study of these mysterious bodies.

In the first place, though comets make a great show in the heavens, we have good reason to believe that the amount of matter in them is comparatively insignificant. The laws of gravity are well established, and we can now *weigh* planets, moons, and suns almost as accurately as if we could put them into a veritable balance; but comets, notwithstanding their enormous *bulk*, and the tremendous display they make with their hairy heads and their enormous tails, are such thin and insubstantial things that they defy every attempt of astronomers to determine their *mass* or the actual amount of matter in them. This much, however, we are sure of: that while comets are often so disturbed by the attraction of planets as to have their course delayed for days and even months, and their orbits and periodic times radically altered, no planet or satellite has ever been perceptibly affected by the attraction of a comet. Whole years, and even centuries, have been added to or subtracted from the periods of comets by planetary perturbations, but we have no evidence that the period of any planet or moon has been increased or diminished to the extent of a single minute by a comet. In one instance a large comet passed right through Jupiter's quartette of moons, but, though the orbit of the intruder was disarranged past recognition, the little Jovian orbs went serenely on their regular way, as if nothing had happened.

It is now generally believed that the original home of comets is in the stellar spaces outside the limits of our solar system, and that they are captured, so to speak, by the sun in the long lapse of ages; that is, in their roving career they get within the sphere of his attraction, and are drawn towards him. If it were not for the planets they would sweep round him and fly off again, never to return, but planetary perturbations often force the strangers into an elliptic orbit, and they become permanent members of the solar system. Not unfrequently, after a comet is thus captured and given an orbit of some hundreds or perhaps thousands of years, it happens, on one of its return trips, to pass very near one of the larger planets, whose disturbing influence twists it into an elliptical path of quite a short period. Such a comet would have its new *aphelion* (its greatest distance from the sun) near the orbit of the planet which had restricted its path. Each of the larger planets has a family of comets whose orbits it has thus remodelled. As might be expected from the gigantic size of Jupiter, he has been specially successful in trapping comets, and fixing their aphelia just outside or inside of his own orbit. All the noted comets of short period — Encke's, Biela's, Brorsen's, Faye's, D'Arrest's, and others — belong to the Jovian family. The period of Encke's, the shortest of them all, is only about three and a third years.

These facts, and others to which our limits do not permit us to refer, show that comets have a very small *mass;* and since their *bulk* is evidently great, their average *density* must be slight. Many of them appear as mere patches of foggy light, with no perceptible condensation at the centre, and are probably as much rarer or more tenuous than air as air is than lead. In other comets there is more or less of central condensation, while in some a star-like *nucleus* is to be seen in the middle of the head. This nucleus, in large comets, is at least some hundreds of miles in diameter, and is probably either a solid body or a dense group of small bodies, like the "shooting-stars," or meteors, concerning whose relations to comets we shall have something to say hereafter. Stars have been seen through cometary matter in various degrees of condensation, even when thousands of miles in thickness. A recent English observer saw the nucleus of one of last year's comets "pass almost centrally over a star" on the night of June 29th. His attention was diverted by a visitor when the nucleus was *exactly* over the star, but from what he saw he is inclined to think that "the star must have been as perceptible as ever, while the nucleus was actually superposed on it." It is difficult to believe that matter which is transparent in such enormous thickness can be very dense. Some astronomers, however, are of opinion that the nucleus may occasionally have a density equal to that of iron. If a comet with as hard a head as that, and several hundred miles in diameter, should strike the earth, the effect where it struck would unquestionably be terrific. Professor Newcomb, referring to such a possible catastrophe, remarks: —

> At the first contact in the upper regions of the atmosphere, the whole heavens would be illuminated with a resplendence beyond that of a thousand suns, the sky radiating a light which would blind every eye that beheld it, and a heat which would melt the hardest rocks. A few seconds of this, while the huge body was passing through the atmosphere, and the collision at the earth's surface would in an instant reduce everything there existing to fiery vapor, and bury it miles deep in the solid earth. Happily, the chances of such a calamity are so minute that they need not cause the slightest uneasiness. There is hardly a possible form of death which is not a thousand times more probable than this. So small is the earth in comparison with the celestial spaces that if one should shut his eyes and fire a gun at

random in the air, the chance of bringing down a bird would be better than that of a comet of any kind striking the earth.

Though it might not be pleasant to be thus bumped by the head of a comet, we have no reason to fear the switch of the monster's tail. It is probable, indeed, that our earth actually passed through the tail of the brilliant comet of 1861, without our being aware of it, at least on this Western Hemisphere. Figure 1 shows the position of the earth at *E* on the 30th of June, 1861, in the tail of the comet, whose head was millions

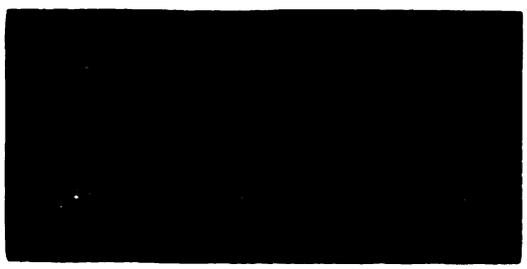

Fig. 1.

of miles away, and Figure 2 represents a section of the tail with the planet passing through it. As the tail consists of something much less dense than air, even in the uppermost strata of our atmosphere, it is not surprising that we did not suffer from the encounter, if it occurred.

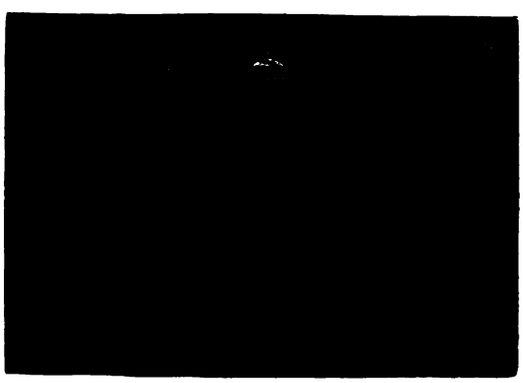

Fig. 2.

According to English observers, the appearance of the sky on the day when the earth is supposed to have passed through the comet's tail was somewhat like that on the famous "yellow day" of the last autumn. One of them says: —

The sky had a yellow, auroral-glare-like look, and the sun, though shining, gave but feeble light. The comet was plainly visible at 7.45 o'clock (during sunshine), while on subsequent evenings it was not seen till an hour later. In the parish church the vicar had the pulpit candles lighted at seven o'clock, which proves that a sensation of darkness was felt even while the sun was shining. The comet itself had a much more hazy appearance than at any time after that evening.

The physical and chemical constitution of comets, their relation to meteors, and sundry other matters must be left for another article.

EXPERIMENTS FOR YOUNG CHEMISTS.

BY PROF. E. J. HALLOCK, PH. D.

VII.

CARBON.

FILL a saucer or evaporating dish half full of water, and place it over the luminous gas flame, a candle, or a common lamp. The bottom of the dish will blacken at once, and in a short time a considerable quantity of lampblack (soot) will collect on the dish. An alcohol lamp or Bunsen burner does not deposit soot.

Place some pieces of dry wood in a test tube, and close the tube with a tuft of cotton. If the test tube be carefully heated, the wood will soon be converted into charcoal, another form of carbon. A piece of fresh charcoal introduced into ammonia gas will absorb a large quantity of the gas.

CARBON DIOXIDE.

This substance, CO_2, is frequently called carbonic acid, but it contains no hydrogen, and does not fall within the definition of an acid.

Introduce into a bottle, such as was used for generating hydrogen, several pieces of marble, and enough water to fill the bottle half full. After fitting it with a cork carrying a funnel and delivery tube, pour into it a small quantity of sulphuric or hydrochloric acid. Effervescence begins, and a heavy gas is given off, which can be collected in an empty bottle by downward displacement, as in the case of chlorine. This gas is, however, colorless, and we can tell when the bottle is full only by inserting into it a lighted candle attached to a bent wire. Carbon dioxide extinguishes a taper so quickly that we can easily decide how much gas there is in a vessel by noticing the point at which the candle ceases to burn. The reaction is as follows: $CaCO_3 + 2HCl = CaCl_2 + H_2O + CO_2$.

The specific gravity of this gas is found in the usual manner: —

1 Carbon	12
2 Oxygen	32
Molecular weight CO_2	44
Specific gravity	22

Carbon dioxide is so heavy that it can be poured from one vessel to another, or dipped up in buckets, like water.

Put some clear lime-water in a test tube, and fill it up with pure water. If it becomes milky or turbid, filter it. Then pass some of the carbon dioxide into the diluted lime-water. At first a white precipitate is formed, which consists of carbonate of lime: $CaO + CO_2 = CaCO_3$. If a current of this gas be passed into the lime-water for a much longer time, the liquid will become clear again, because carbonate of lime is soluble in a solution of carbonic acid. Such water frequently occurs in nature, and is called "temporarily hard water." On boiling the solution it again becomes milky, because the gas is less soluble in hot water, and hence is expelled by boiling.

Breathe through a glass tube into a test-tube containing lime-water; it soon becomes milky, because carbon dioxide is formed in the lungs, and given out with the breath. Lime-water is the usual test for carbon dioxide.

Introduce a lighted candle into a bottle containing air or oxygen, and let it burn until it goes out. Then remove the candle, pour in a little lime-water, and shake the bottle. Its milky appearance proves the presence of carbon dioxide, which is always formed by the combustion of carbon or any of its compounds.

Mix together one gram of sodium carbonate, or, better, the bicarbonate, and two grams of tartaric acid. When thoroughly mixed poured 25 cc. of water upon the dry powder; a brisk effervescence results, and a large quantity of carbon dioxide is given out.

All carbonates effervesce with acids. Chalk is a carbonate of lime, but less pure than marble. It effervesces violently when touched with a drop of acid. The ordinary black-board crayon will not effervesce with acid, because it is not made of chalk, as some suppose.

CARBON MONOXIDE.

This substance, CO, is also called carbonic oxide. Introduce one gram of oxalic acid into a test tube, and pour upon it enough strong sulphuric acid to cover it. Adapt a cork and delivery tube, as in making oxygen (Figure 1). It may be collected over lime-water. It is very poisonous; hence care must be taken not to inhale it. Upon heating the tube both oxides of carbon are given off, as will be seen by the following formula: $H_2C_2O_4 + H_2SO_4 = CO + CO_2 + H_2O + H_2SO_4$. The sulphuric acid has a strong affinity for water, and in order to obtain it will destroy the oxalic acid in the manner indicated. The carbon dioxide will render the lime-water milky, thus proving its presence. Collect the carbon monoxide in a wide-mouthed bottle, and ignite it. It burns with a blue flame, such as may be seen playing over a coal fire after fresh fuel has been added. Its specific gravity is 14; hence it is nearly as heavy as atmospheric air.

MALARIA IN FLOWER-POTS.

OUR fair readers who delight in house-plants will be sorry to hear that their pets may bring malaria to their homes. Professor Tommasi-Crudeli has recently pointed out in the *Practitioner* that the keeping of numbers of plants in heated and imperfectly aerated rooms may sometimes cause malarial infection, even in regions where malaria is unknown. Professor Eichwald, of St. Petersburg, reports the case of a Russian lady, who passed the greater part of her time in a well-heated drawing-room, containing a considerable number of flower-pots; and although she lived in a perfectly salubrious locality, she was attacked by an intermittent fever of true malarial character. After the removal of the flower-pots her cure was complete, and no more relapses occurred.

The subject of plants in living and sleeping rooms has frequently been discussed, but the real cause of their unwholesome influence seems to have been overlooked. It is not the plants, but the damp earth in which they are planted, that breeds disease, — at least, if we are to accept the Roman professor's conclusions.

SCIENTIFIC BREVITIES.

LOCUSTS AS FOOD. — Some writer remarked long ago that, in our warfare against injurious insects, it might be well for us to turn the tables upon them by *eating* them. This has been done in the East, so far as locusts are concerned, ever since the days of John the Baptist, and probably from a much earlier period. A recent writer says: "In Arabia and Northern Africa, locusts are still used as food, and form an article of commerce. The inhabitants usually tear off their wings and wing coverts, and then bake them. *Gryllus lineola* (Fabr.) seems to be the species which is eaten and prepared in the manner above detailed in Barbary. The natives of Senegal dry another species, of which the body is yellow,

spotted with black, and which Shaw and Denon have figured in the account of their voyage in Africa; they then reduce them to powder, which they use as flour. Captain Burton tells us that the black leather-like variety of locust, called by the Arabs 'Satan's ass,' is eaten by the Africans, as are many other edibles upon which strangers look with disgust.

"There is some compensation in the circumstance that if the locusts devour the food of man they are themselves a source of food. In Morocco they are collected in sacks by night, and first boiled in salt and water, and then fried. Only the softer part of the body is eaten, much as we eat prawns, which they resemble in taste. They are considered to be wholesome food, and in perfection as soon as the insects can fly."

Resuscitating Frozen Animals. — There has been a conflict of opinion between experimenters on the one hand and clinical surgeons on the other as to the best method of resuscitating frozen animals (including human beings). While the latter almost without exception advocate the gradual introduction of heat, the former (Beck, Horwat, and Jacoby) claim that it should be applied rapidly. In order to decide this question, Laptschinkski has performed careful experiments upon dogs in the clinic of Professor Manassem. The results were confirmatory of his views on the subject, and are summarized as follows: Of twenty animals treated by the method of gradual resuscitation in a cold room, fourteen died; of twenty introduced at once into a warm apartment, eight perished; while of twenty placed immediately in a hot bath all recovered.

The Monks and Dogs of St. Bernard. — An exchange says: Among the many results of the railway, the noble St. Bernard dog must go. Not necessarily will he become extinct; but as the rescuer of the foot traveller upon the St. Gothard he will be known no longer. The great Catholic charity of St. Bernard will come to an end in a few months. The railway under the Alps will draw travel away from the mountain road; and poor indeed must be the man who will undertake the weary tramp, and risk the avalanche for the sake of saving the little railway fare. The mission of the St. Bernard monks will have been accomplished, and their record will go upon the pages of history as, perhaps, the most noble, beautiful, and touching in the annals of the world. Their work is done, and they will close their doors amid the grateful thanks of all civilized people.

Salt Lakes in Texas. — There is, says an exchange, in Hidalgo County, Texas, a salt lake known as Sal del Rey, which is about a mile in diameter and nearly round. On all sides it is hemmed in by land higher than the surrounding country, so that it can have no communication at the surface with any other water, but it is rarely dry. The bottom of the lake consists of solid crystallized salt in layers about a foot thick, with a thin deposit of earth between the layers. When excavations are made, they are soon filled with water, and the salt it contains is precipitated so rapidly that in a few days the hollow is completely filled. It is supposed that this lake is on a bed of mineral salt.

The Wonders of Paper. — At the Melbourne exhibition, held recently, there was a complete dwelling house made entirely of paper, and furnished throughout with the same material. There were paper walls, paper roofs, paper ceilings, paper floorings, paper joists, paper stairways, paper carpets, paper bedding, paper chairs, paper sofas, paper lamp, paper frying pans, and even the stoves, in which bright fires were kept burning daily, were of *papier maché*, and when the fabricator of this mansion gave a banquet in this dwelling, the tablecloths, the napkins, the plates and cups and saucers, the bottles and the tumblers, and even the knives and forks, were likewise made of paper.

HOUSEHOLD RECIPES.

Diet in Cases of Debility. — Beat up an egg in a bowl, and then add six tablespoonfuls of cold water, mixing the whole well together; then add two tablespoonfuls of farina of potatoes; let it be mixed thoroughly with the liquid in the bowl; then pour in as much boiling water as will convert the whole into a jelly, and mix it well. It may be taken alone, or with the addition of a little milk, in case of stomachic debility or consumptive disorders.

To Extract Ink. — To extract ink from cotton, silk, and woollen goods, saturate the spot with spirits of turpentine, and let it remain several hours; then rub it between the hands. It will crumble without injuring the color or texture of the fabric. For linen, dip the spotted part in pure tallow, melted; then wash out the tallow, and the ink will disappear.

Removing Paint Stains. — Stains of oil paint may be removed with bisulphide of carbon; many by means of spirits of turpentine; if dry and old, with chloroform. For these last, as well as for tar spots, the best way is to cover them with olive oil or butter. When the paint is softened the whole may be removed by treatment, first with spirits of turpentine, and then with benzine.

Liquid Starch Finish. — Make an emulsion of spermaceti, one ounce; gum arabic, one ounce; borax, one ounce; glycerine, two and a half ounces; water, fourteen and a half ounces; perfume sufficient. Three spoonfuls to about four ounces of boiling starch paste.

Bug Poison. — The following recipe is given by W. M. Parker in the *Chemists' and Druggists' Bulletin*: —

Corrosive sublimate	4 oz.
Common salt	2 "
Water	1 pint.

The salt is substituted for *alcohol*, thereby saving all the alcohol that is usually put in to dissolve the corrosive chloride.

Practical Chemistry and the Arts.

PERMANGANATE OF POTASH.

This compound is not so well known outside of chemical laboratories as it deserves to be, and, in response to various inquiries regarding its properties and uses, we propose to give our readers a short description of it.

Permanganate of potash is one of the most curious salts known in mineral chemistry. The acid as well as the base contains a metal: the former a heavy metal; the latter an alkaline metal. Manganese is a metal closely resembling iron, although much less abundant. In the metallic state it finds no use in the arts except in an alloy with iron known as *spiegeleisen*. In nature it is usually found in combination with two equivalents of oxygen, as a binoxide. The native mineral is known as *pyrolusite*, but, being of a black color, it is more frequently called black oxide of manganese, or manganese ore.

When any oxide of manganese is mixed with an alkali, like carbonate of potash, and fused, a green substance is formed, called manganate of potash, or *chameleon mineral*, because of its property of changing color. If this substance is dissolved in water containing free alkali the solution will also be green, but on warming or diluting it turns red. If the potash is not in too great excess, the solution which is red when hot turns green again if briskly stirred after cooling. The red solution contains permanganate of potash, $K_2Mn_2O_8$; the green solution contains the manganate, K_2MnO_4. As the green salt is very fickle it has but little use, except in making the red one, so we will pass at once to the commercial method of making the permanganate of potash.

On a large scale, 1000 lbs. of caustic potash solution of 45° B. (spec. grav. 1.44) is mixed with 210 lbs. of chlorate of potash, and evaporated to dryness. During the evaporation 360 lbs. of the binoxide of manganese, in powder, is stirred into it, and the mixture heated until it is in a state of quiet fusion. It is then allowed to cool, and afterwards pulverized. The powdered mass is again heated in small iron kettles to a red heat, until it is semi-fluid. When cold, the green mass is again broken up and heated in a kettle with a large quantity of water. In the first part of the operation manganate of potash is formed, which is decomposed by the water into permanganate of potash and binoxide of manganese. The clear liquid is decanted and evaporated until it crystallizes.

Permanganate of potash forms long needles of a dark purple-red color. It dissolves in 16 parts of water, forming a beautiful purple solution, which becomes pink on dilution. When 1 grain of the salt is dissolved in 50,000 times its own weight of distilled water, the solution has a beautiful pink color, which it retains until diluted to three or four times this extent. The importance of this fact will be seen later.

The peculiarity of the permanganates, on which most of their uses depend, is that they contain an excess of oxygen, which they are willing to part with on very liberal terms. Let a dilute solution of permanganate flow into a solution of any salt of the protoxide of iron, its color is destroyed, and the iron is oxidized to its highest state. Let it flow into a solution of sulphurous acid, the color is rapidly destroyed, and the sulphurous acid is converted into sulphuric acid. Let it flow into water which contains organic matter, sewage, etc., the color will be destroyed with greater or less rapidity according to the quantity and nature of the organic matter. Pass a current of illuminating gas through a dilute solution of permanganate of potash, the pink color will soon be destroyed. In this and several other cases the liquid acquires a brown color, due to an oxide of manganese, in a fine state of division, suspended in it.

Among the uses of this substance, based upon the properties above described, we have, first, its use in the estimation of iron in ores or alloys. To determine the quantity of iron present in any compound we convert it into the sulphate; reduce the iron to the ferrous or protoxide form, by means of zinc; and then allow a dilute solution of permanganate of potash to flow slowly from a graduated vessel into the iron solution, until the latter acquires a pink color. A weighed quantity of pure iron wire is dissolved in sulphuric acid, the air being excluded, and then treated with some of the same permanganate solution. The quantity of iron in each solution will be proportional to the volume of the chameleon so-

lution destroyed. In this case an excess of acid is present, which dissolves the oxide of manganese, and the liquid does not turn brown.

A dilute solution of the permanganate of potash has been employed in a similar manner for estimating the amount of organic matter in potable water, but the results are not very reliable. This much, however, is certain, that water which destroys a large quantity of the permanganate is unfit to drink. This salt, however, has the power of purifying bad water by oxidizing the organic matter. Hence, if it becomes necessary, as is sometimes the case when travelling, to drink impure water, it is a wise precaution to throw in a crystal or two of permanganate, just enough to cause a permanent pink color, and wait until the brown precipitate settles before using it.

Permanganates possess bleaching properties and are used to restore engravings that have become yellow with age. They are also useful as disinfectants, possessing no odor. A dilute solution may be employed as a mouth-wash with advantage. Alkaline manganates and permanganates have been used as disinfectants under the name of "Condy's Fluid," red and green. De Varona speaks of them as invaluable, admitting of a wide range of application, and essential to every household.

Permanganate of potash is employed to deodorize alcohol, to purify cotton-seed oil for culinary purposes, and for many other similar applications. It has also been used in medicine to a limited extent, and for dressing wounds, etc.

SALICYLIC ACID FOR PRESERVING FRUITS.

ALTHOUGH the use of salicylic acid in wines and preserved fruits has been strictly forbidden in France, yet in Germany and other countries its use is steadily increasing. Dr. Renk, of the Royal Hygienic Institute of Munich, has issued a report, in which he asserts that among all antiseptics salicylic acid deserves the preference for the preservation of alimentary substances, as it does not in any way affect either the good quality of the articles preserved or the health of the consumer.

We have received frequent inquiries regarding the quantity of salicylic acid to be used. In reply to such questions we would say that Dr. F. Von Heyden, of Dresden, who has investigated the subject, recommends for most purposes one drachm (about two teaspoonfuls) of crystallized acid to every three pounds of fruit. The jars may also be covered with white paper soaked in an alcoholic solution of salicylic acid. In manufactured preserves, marmalades, etc., two ounces of acid are required for every hundredweight of pulp. Raw fruit can be preserved a long time when wrapped in clean salicylated paper. The juice of berries or any other kind of fruit will keep well for more than a year if treated immediately with salicylic acid at the rate of 1 drachm to 3 lbs. of juice. This leaves the addition of sugar optional.

CEMENTS.

EXCELLENT cements may be prepared from some of the constituents of milk, particularly caseine. The following are good formulæ for some of them: —

Parabolic Cement. — This is a variety of caseine or cheese cement, prepared as follows: Curdle skim-milk with rennet or vinegar, press out the whey, and dry the curd by a very gentle heat, but as quickly as possible. When quite dry, grind it in a pepper or coffee mill, and triturate it in a mortar until reduced to a very fine powder. Mix 10 parts, by weight, of this powder with 1 part of quicklime, also in very fine powder, and to every ounce of the mixture add five or six grains of camphor. Triturate the whole well together, and keep in vials well corked. It is used to unite glass, earthenware, etc., which it does very strongly. It is made into a paste, with a little water, as wanted, and applied immediately.

Milk Cement. — This cement is not so generally known as it ought to be. It is the simplest and best domestic cement for repairing china and crockery. The process consists simply in tying the parts firmly together and boiling them in skim-milk. The tying together of the pieces of a round cup or bowl is not a very simple matter, but it can be done by going the right way to work. First, arrange the parts in their proper positions, and, if a bowl, set it mouth down, as the pieces will keep their arrangement best in this position. Then wind stout tape round the article, so as to hold the pieces together. Tape is far better than twine, and some pieces should be kept for that purpose. It is easy to draw the tape tight until we come to tie the ends, and then special devices must be used. When sufficient tape has been wound round the article, let one person hold it from slipping, by pressing a finger firmly on each end, and then let another person tie the ends in a firm knot, but leaving the tape so loose from the article that a pencil or stout skewer may be passed under it. Then, by twisting the skewer, the tape is tightened in the same way that a surgeon compresses an artery with his tourniquet; and by passing the fingers over the tape, and smoothing it forward towards the ends, all the pieces may be pressed together with a firmness that cannot be obtained in any other way. The article should now be placed in a pan of cold milk (skim-milk is the best and cheapest), which should be gradually heated to the boiling point, and kept at this temperature for some time, — say half an hour to an hour, — care being taken not to allow it to burn. The articles are allowed to cool in the milk, and when taken out are wiped dry, and allowed to stand for a day or two, until the cement has become quite hard. They may then be washed off with warm water, and the parts will be found to be strongly cemented together. The same milk may be used again, but not with such good effect. Generally, however, it is possible to pack quite a number of articles in the pan in the first place, especially if they can be *nested*, or placed one within the other.

ANALYTICAL NOTES.

RECOGNITION OF MINERAL ACIDS IN VINEGAR. — The use of gurjun oil for detecting mineral acids in vinegar is recommended by A. Jorissen in the *Journal de Pharmacie d'Anvers*. To a mixture of one drop of gurjun oil and 25 drops of glacial acetic acid one drop of the vinegar to be tested is added, and after agitation 4 to 6 drops of acetic acid. A violet color is produced in seven minutes when there is one part of sulphuric acid in 200 parts of water, which color does not disappear on the addition of 30 drops of alcohol. Calcium sulphate and cream of tartar do not produce the color.

TESTS FOR ERGOT IN FLOUR. — The following test of Zinnia has been improved by Jacobs (*New York Medical Journal*). The suspected flour is repeatedly boiled with alcohol; it is then filtered, and a little cold alcohol, previously acidulated with sulphuric acid, is added. The presence of ergot will be demonstrated in a few minutes by the appearance of a beautiful rose color on the upper layer of fluid, from the intensity of which tint the amount of ergot may be judged.

SEPARATION OF SILVER FROM LEAD. — E. Donath proposes to separate these two metals by adding to a solution of both 4 cc. of pure glycerine, then an excess of ammonia and 10 to 15 cc. concentrated potassium or sodium hydrate, and boiling from 3 to 5 minutes, when the silver will, he says, be entirely precipitated. It is filtered when cold, and washed first with boiling water, then with acetic acid, and again with water. The lead can be precipitated from the filtrate by means of sulphydric acid.

OZOKERITE. — The discovery is reported, near Gisborne, New Zealand, of a large deposit of mineral wax. According to an examination made by Mr. J. H. Stubbs, chemist, at Port Jackson, it contained 50 per cent. of paraffine, 10 per cent. of kerosene, 10 per cent. of light oils, 20 per cent of heavy oils, and 10 per cent. of earthy matter.

INDUSTRIAL MEMORANDA.

PREPARATION OF POTASSIUM CHLORATE. — This substance is usually prepared from calcium chlorate $Ca(ClO_3)_2$, made by the action of chlorine gas upon milk of lime. The calcium chlorate is decomposed by mixing it with potassium chloride. The potassium chlorate crystallizes out, and leaves calcium chloride in the mother liquor. Unfortunately, a considerable quantity of chlorate is left in the mother liquor and wasted. To prevent this loss, in part at least, Pechiney proposes to remove a large part of the calcium chloride from the solution before adding the potassium chloride. Two methods are proposed: one of which consists in concentrating to 48° B., when a large proportion of that undesirable salt will crystallize out. The other consists in adding to it an excess of lime, whereby basic chlorides are formed, which can be removed. The two methods may also be used together.

If it is desired to make sodium chlorate, the solution of calcium chlorate, which has been treated as above described, is decomposed with sodium sulphate. Whatever lime remains in the solution is removed by adding carbonate of soda. Upon evaporating the solution, the sodium chloride will crystallize out first, leaving the sodium chlorate in solution.

SWEETENING JOHN BULL'S BEER. — It takes a good deal of sugar to "qualify" the bitter in the national beverage of Britain. From a parliamentary return just issued, it appears that the amount of sugar consumed in breweries for the year ending September 30, 1880, was as follows: England, London, 47,806,196 lb.; the provinces, 95,311,008 lb.; Scotland, 963,249 lb.; Ireland, 4,325,693 lb., — making a total for the United Kingdom of 147,906,146 lb. In 1856 the total consumption in the United Kingdom was only 11,790,529 lb. The whole amount consumed in the twenty-five years from 1856 to 1880 inclusive was 1,108,244,178 lb.

NITRATES IN NEVADA. — An extremely important addition has lately been made to the list of valuable minerals found in Nevada. It consists in the discovery of large beds of nitrates near Brown's Station, Humboldt Desert. The State Mineralogist of California, Mr. H. G. Hanks, finds the mineral to be very rich nitrate of soda, and regards the discovery as one of the most important made on the Pacific coast. Mr. Hanks expresses his opinion that other similar deposits will be found, as large regions of Nevada and California are of a form suitable for its existence. Many years ago he predicted the discovery of nitrates in the southern part of California, but as yet none has been found. The Nevada discovery will doubtless turn the attention of prospecters to this valuable mineral.

Agriculture.

FARMERS' INSTITUTES.

A CLASS of farmers' meetings have been organized in Massachusetts, called "institutes," which are intended for the discussion of practical matters connected with husbandry and for lectures. In looking over the reports of these meetings, as presented in the agricultural press, we are convinced that considerable good is accomplished, but, on the other hand, no small amount of mischief results. This comes from the erroneous and loose statements and unsound views which are promulgated by speakers and debaters who are not qualified to impart correct and useful information. A study of the opinions and views presented by farmers at these meetings shows clearly the necessity for a higher and better school of instruction for husbandmen than is now afforded. Before practical farming can be conducted intelligently and successfully, those pursuing the industry must be taught thoroughly the elementary principles of the departments of science which have a direct bearing upon agriculture. What we need before institutes can be made safe and useful is schools for instruction in elementary science, on the plan which we presented in the address before the Essex Agricultural Society last autumn, and which has been published in the Proceedings of the society.

We are more fully convinced than ever that a change must be made in methods of elevating and improving farmers as a class. At present they are not so well qualified to judge of what is right and what is wrong, of what is truth and what is error, as they should be. They are liable to be led by ignorant or designing men into errors and fallacies, which tend to discourage and disgust them in their calling, and lead them away from thrift and success. The records of institute meetings show the standard of mental vigor and intelligence possessed by the practical workers in the field, and the indications are unsatisfactory. Not all institute meetings present such absurd records as one held at Grafton in February, but many do little more credit to the participants in the addresses and debates. This meeting was attended by a large number of farmers, some of them among the best known in the State, and the proceedings were called "interesting" and the instruction "valuable." The rambling, absurd talk of some of the speakers, as given in the reports, creates a feeling of discouragement which is almost painful. We prepared the following notes upon the proceedings, and they were published in the *Massachusetts Ploughman* of this city: —

The report of the proceedings at the recent Farmers' Institute at Grafton, if a correct one, leads to the conclusion that it was quite extraordinary in the nature of the information conveyed by some of the speakers. It is difficult to understand how Mr. Mills, of New Jersey, who is known as a progressive farmer, can cherish so many erroneous views upon the common principles of husbandry, and be successful in his labors. It is also a matter of surprise that he was allowed to make such statements in a meeting of some of the most intelligent farmers in Massachusetts, and the statements remain uncorrected. Mr. Mills tells his listeners, in answer to a question "how 30 lbs. of ensilage or 6 of dry food would maintain an animal," "that nine tenths of the nutriment is in the water; when the water is gone the nutriment is gone. In drying hay 8½ tons of water goes off and 1½ tons of woody fibre and gum remains; he had rather have a ton of the water that went off than a ton and a half of the dry hay that is so carefully saved." A statement of this nature has no truth in it whatever. In the process of drying hay none of the food constituents are lost. The water only is evaporated, and it is lost *as* water; leaving behind all the sugar, starch, and other carbo-hydrates, all the nitrogenous compounds, everything, in short, which is valuable. A pound of dry grass contains all the nutriment found in six or eight pounds of the green substance as it falls before the scythe of the mower. If Mr. Mills's statement as a principle were true, not only farming, but every other industry, would come to an end. The error of the gentleman is a common one among farmers who are not investigators; it is involved in supposing that because the active principles of food are held in suspension in the juices of plants, therefore when they are evaporated the valuable elements leave with the water. An apple, an orange, or any other fruit, as well as the grasses, can be *dried*, and nothing is lost but *pure water;* common experience as well as science teaches this truth. The other statements of Mr. Mills are to a large extent equally erroneous and preposterous, and for the credit of Massachusetts husbandry should not pass unnoticed. The "law" which he has "discovered" regarding the causes of decay or fermentation of bodies is a fallacy. Organic matter in all possible forms is constantly decaying when one or more of the three agents, air, warmth, and moisture, are to a large extent wanting. The vegetable matter in the bottom of a cold peat bog slowly decays, although away from heat and air.

Mr. Mills does not understand the laws of chemical combination and change, and is not fitted to give information upon such topics. He talks of "*lactic*" fermentation in ensilage, and of "clay and carbon" as "moisture retainers," in a way which makes it certain that he is not well informed upon the subject he brought before his hearers.

It is an unwelcome task to call attention to the errors and absurdities which unfortunately are promulgated at institute meetings, but when Massachusetts farmers are told by a speaker that "he had rather have a ton of the water which is dried out of grass in hay-making than a ton and a half of the dry hay," a protest to such nonsense must be made.

THE ANALYSIS OF SOILS.

THE difficulties that beset the chemist who undertakes the analysis of a soil may be compared with those encountered in water analysis. Soils are composed almost entirely of silica and alumina, in varying proportions; water is composed of oxygen and hydrogen, in unvarying proportions. But it is not the chief constituents of either that interest us most; it is the substances which are present in almost infinitesimal quantities which make up the distinction between fertile and barren soils, between wholesome and dangerous water.

The first difficulty encountered in soil analysis is to get a fair sample. Different parts of the same field are known to vary in fertility, while still greater versatility will be found at different depths. The method of sampling employed for ores, of thoroughly mixing samples taken from several points, could be employed for soils; but soils and sub-soils should be kept separately and analyzed separately.

Then comes the question how to bring the soil into solution before analyzing. Is all the potash actually present in the soil to be taken account of in the analysis? can the plant avail itself of the insoluble compounds of potash? or shall we estimate only those which are soluble in water or in acids? Professor E. W. Hilgard says that such agents as fluohydric acid and alkaline carbonates go deeper by far than the solvents naturally acting in soils bearing vegetation will go within the limits of time in which we are interested. The solvent selected by this chemist in his investigations was hydrochloric acid, of about the specific gravity of 1.115, the soil being digested in it for five days on a water bath.

A similar problem arose some time since in regard to the solvents to be employed in the analysis of superphosphates used as fertilizers, it being generally conceded that the more insoluble compounds of phosphoric acid were of little use in agriculture. The matter has been set at rest temporarily by agreeing to call that portion which is soluble in ammonium citrate solution *available* phosphoric acid, all the rest being set down as insoluble. This solvent, ammonium citrate, was selected because it does not dissolve the natural or mineral phosphates, but will dissolve the artificially prepared phosphates. The line is undoubtedly an arbitrary one, and if strong hydrochloric acid is to be used in soil analysis, where phosphoric acid is also to be sought, why not use it in analyzing the fertilizers to be applied to the soil, not as a substitute for the citrate solution, but instead of the alkaline carbonates? If hydrochloric acid is a proper solvent in one case, it must be equally so in the other.

The methods of analysis employed for the soils when in solution, do not differ essentially from those in common use. The "volatile matter," which is made up of its organic matter and combined water, is determined by ignition. Professor Hilgard thinks a determination of the amount of nitrogen unnecessary, as the nitrogen percentage of the mould of natural soils adapted to agriculture is not likely to vary much; and hence the humus percentage may probably be taken as roughly proportional to the total nitrogen of the soil. In manures, fertilizers, and muck, of course, the percentage of nitrogen is more important.

After obtaining an accurate and reliable analysis of any given soil, the next problem is to interpret the results. A chemical formula and a chemist's report are alike useless to the farmer. It must be translated before it can be understood; and here, unfortunately, much ignorance still prevails among the best of us, for it will become possible to predict the value of a soil from its analysis only when a long-extended series of careful experiments have shown the exact relation that exists between composition and fertility.

This much seems to be definitely known: that certain elements must not be absent, nor present in too small quantities.

From an extensive study of virgin soils, Professor Hilgard arrives at the conclusion that, other things being equal, the fertility of a soil is measurably dependent upon the presence of a certain minimum percentage of lime. In the lightest sandy soils this should not fall below one tenth of one per cent.; in clay loams one fourth; and in heavy clay soils one half.

Of phosphoric acid less than five hundredths

(0.05) must be regarded as a serious deficiency. The maximum found in an upland soil is about a quarter of one per cent.; but in the black prairies of Texas, nearly half (0.46) of one per cent. was found.

Potash percentages in clay loams range from 0.8 to 0.5 per cent.; in lighter loams from 0.45 to 0.30; in sandy loams below 0.3. Sandy soils of great depth may fall below 0.1 consistently with good and lasting productiveness.

Sulphates and chlorides are less important, the latter varying greatly.

Iron in the form of the hydrate, finely diffused, appears to be an important soil ingredient on account of its physical as well as its chemical properties. It may vary from 2 to 12 per cent.; and occasionally reaches 20 per cent. or more.

So much depends upon the physical state of the soil, its power of absorbing moisture, the size of the particles, etc., that many attempts have been made to employ mechanical analysis, but with little success.

Although Professor Hilgard seems to have been able to trace some relation between percentage composition and fertility for the virgin soils of the West, the best chemists in Europe are compelled to admit that they are incompetent to arrive at anything more than mere guesses by the analysis of their long cultivated and manured soils.

BAT GUANO.

For a considerable number of years many notices have appeared in the newspapers and in scientific journals of the "bat caves" in Texas and elsewhere in the Southwestern States. The enormous quantity of bat excrement found in these caves has astonished every one who has read the statements made. There can be no doubt of the truth of these, in general, and of the great value of the excrement deposits as manurial agents. Analyses of the contents of the caves have been made, which show that they are very rich in potash. The excrement has, to a considerable extent, been collected and put on the market as a fertilizer, but we do not know in what market it may now be found. The following is an extract from a letter received from P. J. Edwards, Esq., of Hillsboro, Illinois, in which he presents some interesting information regarding the extent of the deposits The analysis shows a high per cent. of nitrogen in the excrement, in addition to the potash.

During the late war the Confederate authorities made a contract with a party in Texas for the delivery of a large quantity of saltpetre for the manufacture of powder. Finding himself likely to lose money by importing it, and being something of a genius, he conceived the idea of making it from the bat dung which had accumulated in the limestone caves of Western Texas. By the simple process of leaching in an old-fashioned ash hopper, evaporating, and washing the resulting salt with a saturated solution of nitrate of potash, he obtained the astonishing quantity of a *pound* of the potash, pure enough to make powder, from each *bushel* of guano. Since potash and nitrogen in the form of nitric acid are among the most valuable elements of artificial manures, it occurred to me at the time, and has often since, that here was a most valuable source of concentrated manures, and it is on that point I ask information. Owing to the kind of food (almost exclusively insects) upon which the bat lives, I suppose that the amount of nitrogenous material contained in the excrement in other forms might be even greater than indicated. As to the manner of procuring the salt, I had no reason — knowing the party well — to doubt it, and as to the amount, which I did doubt, a cursory examination of his books led me to think he had not overestimated it.

The supply of such material is practically unlimited, a single cave which was surveyed by Confederate engineers being estimated to contain between two and a half and three million bushels. This is in so far hearsay, as I only heard it frequently spoken of in the adjutant's office in San Antonio, in which I was employed at the time. The opening up of that country by railroads has rendered all this vast mine of wealth, either as a fertilizer, if of value as such, or as a cheap source of saltpetre, available. Judging from what I have seen myself, and the reports of disinterested and reliable parties who were better posted as to the extent of the caves, I should say there were not less than twenty million bushels along the lines of railroads at distances varying from one to ten miles.

ELECTRICITY AND AGRICULTURE.

Prof. I. A. Barrol, the well-known scientist, has published his lecture upon the applications of electricity to agriculture, delivered in the Hall of the Congress of Electricians at Paris last October.

After dwelling upon the importance of electricity to agriculture, he traces historically the researches and experiments which have been carried on with electricity on vegetation, and notices those of Dr. C. W. Siemens on his farm, where, after the electrical power has been employed in the day for various agricultural work, the light is applied at night in experimental efforts on vegetation. The similar works of M. Deherain, a Frenchman, in his greenhouse are alluded to. Among other useful applications are the action of electricity against frost and in preventing the putrefaction of meat, electric ploughing, electric railways, motive power for saws, pumps, thrashing machines, and milling, lightning conductors, and artificial incubation by electricity.

Finally, as the result of numerous experiments recently made, it may be assumed: (1.) That the electric light favors the formation of chlorophyll in the leaves and stimulates the growth of the plant. (2.) That plants do not require a period of repose during the twenty-four hours, and if after submitting them to the solar light in the day they are submitted during the night to the electric light, their growth and vigor proceed much more rapidly. The blooming of flowers and the ripening of fruit are much hastened. (3.) That the cost of electro-culture will be very moderate where there exist natural sources of motive power, such as falls of water, which can be utilized for putting in action the machines productive of light.

One Cow's Milk. — One of our exchanges says that "one cow's milk" may be worse than the mixed article, as proven by a case in which a baby fed on the milk of one cow sickened and died of tubercular disease, the cow itself dying two months later of tuberculosis. Had the milk of that cow been mixed with milk obtained from a dozen others, the child would not have received daily such large doses of the diseased milk, and might have lived. Probably condensed milk is as safe a food as can be used when there is any doubt as to the quality of the ordinary milk served to a family.

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, APRIL 1, 1882.

GLUCOSE BEFORE A CONGRESSIONAL COMMITTEE.

The glucose manufacturers of the West appeared in Washington in great force, March 8th, to protest before the Ways and Means Committee of Congress against the passage of the bill taxing the manufacture of glucose, and also the product in its various forms. The bill before the committee was indeed extraordinary in its provisions, imposing a tax of one hundred dollars upon all manufacturers and upon all dealers, and a further tax of ten cents a pound upon glucose in its solid form, and one dollar upon each gallon of the syrup. The imposition of such heavy taxes would be absolutely prohibitory, and stop at once the manufacture of the article. This was doubtless the intention of the originators of the bill, and was a great mistake, as such sweeping legislation creates sympathy, and affords those interested opportunity to make a plausible defence and cover up the real merits of the case.

The legislation needed is in the direction of *regulating* the manufacture and sale of glucose, so as to prevent fraud and injury to consumers. Action of this nature cannot be taken too soon by Congress and by our state legislatures, for the glucose business has become an evil of no small magnitude.

The production of this feeble sweet is enormous at the present time, and is almost hourly increasing; and consumers of sugars and syrups, especially among the poor, are defrauded to an extent of which but few have any knowledge. Glucose is mixed with cane-sugar syrups and molasses almost universally, and the solid material is becoming every day a more common adulterant of low-grade, and even high-grade, sugars, so that soon it will be difficult to obtain pure crystallizable sugar in any form. The huge piles of candies in attractive shapes seen in confectioners' shops, and which children purchase freely, are largely composed of glucose; and strained honey in unmixed condition is not found upon the market.

It is too early in its history as a common article of diet to say how great may be its direct or remote deleterious influence upon the health of consumers. The noisy claims of the manufacturers, that it is as innocent as "grape juice" or "honey," must pass as views springing from interest or ignorance. These men are making too much money out of their products to interest themselves much as regards the mischief they may be producing. It is true that the sweet of the grape is due to glucose, and it is also true that honey is about three quarters glucose, but these facts do not prove that the article made out of starch in the Western factories is a harmless article. Before adopting such a conclusion several important points must be considered. If the glucose of the laboratory were as pure as genuine honey, or as the juice of the grape, it might not be desirable or salutar to make it an article of common consumptic

A very large number of individuals are greatly injured by the use of honey, and grape juice so changed as to isolate the glucose was not found in France, in 1811–12, when it was extensively used, to be healthful, or a desirable substitute for cane sugar.

It is certain that the laboratory of nature, in which natural glucose is made, in no respects resembles the laboratories of the Western glucose makers. Starch when brought under the action of acids is changed over into glucose, but what is the character of the vessels in which the reactions are conducted? Are they of copper, zinc, lead, or iron? If any contact is made with metals, the process is objectionable. Unprotected iron cannot be used, as the action of the oil of vitriol would spoil the products. From the almost universal presence of traces of copper in glucose, it is fair to assume that the huge tanks and pans used in the factories are of this metal. Nothing but *glass* or its equivalent can be regarded as *safe* to be brought in contact with the hot acid starch in the process of manufacture, but the magnitude of the manipulating processes must be a bar to its use.

To repeat: If the processes and products were unobjectionable, which they are not, there remain cogent reasons why artificial glucose should not be forced into the markets and into the stomachs of unsuspecting consumers. To obtain the maximum sweet sensation produced by an ounce of crystallizable sugar, two and a half ounces of glucose are required, and this nearly trebles the volume of material needed to satisfy the sense of taste. If one teaspoonful of true sugar is all that is required to sweeten a cup of coffee to the taste, two and a half of glucose is required as an equivalent, and in this we see how objectionable must be this loading down of the organs of digestion and assimilation with a negative substance. Pure glucose represents that point in the descending scale of chemical change in cane sugar which renders it capable of undergoing the process of fermentation, and thus breaking up into new compounds. It is nearer that stage of rapid decomposition which results in the production of alcohol with the evolution of carbonic acid. Glucose undergoes this change in the stomach with greater facility than sugar; and thus we find that honey, which is largely glucose, gives rise to flatulency, colic, and nausea when taken freely with food. It is easy to infer from what has been stated that, while glucose must not be regarded as a poison, it has probably objectionable effects upon the system, which make it an undesirable, if not a dangerous, substance. It is a cheap material, costing but about a cent a pound, and yet it is sold at prices, in the syrup mixtures, higher than the genuine cane-sugar syrups. It is a form of fraud which is fast becoming of immense magnitude, and should receive the immediate attention of law-makers.

We have before presented in the JOURNAL a large amount of information regarding glucose, and therefore it is not necessary to enlarge upon the subject. The methods have been pointed out by which its manufacture and sale should be regulated, and we hope attention will be given to the matter speedily.

THE PUBLISHERS request us to remind subscribers that many of them have not responded to the bills mailed with the December JOURNAL.

BOSTON WATER.

DR. LEFFMAN, of Philadelphia, has made a complete analysis of the Boston water, with the following results, the figures representing grains to the imperial gallon:

Total solids	5.88
Chlorine	0.254
Free ammonia	0.0014
Albuminoid ammonia	0.0182

Odor at 100° T., none.

These results are corroborative of those heretofore presented in the JOURNAL, and show that the water is open to somewhat serious objections on the score of healthfulness. We presume its present condition is better then it was in December last, when the specimens for analysis were taken.

THE INTERSTELLAR SPACE.

Dr. R. T. BROWN, of Indianapolis, Ind., sends us the following synopsis of an essay read before a scientific association in Washington, D. C., in 1872. His views correspond essentially with those of Dr. Crookes, of London, although published before Dr. Crookes's researches were made.

The universe consists of atomized matter and motor force, and each is manifested by the other. While each of the several forms of force acts on the same kind of matter uniformly under similar circumstances, yet on different kinds of matter the same force acts with different degrees of energy.

For example, if we take the force of gravity, and we call the energy which it exerts on an atom of hydrogen 1, then that with which it acts on an atom of mercury will be represented by 200. In the chemical force we find the same diversity; for example, the almost entire absence of chemical affinity in nitrogen, and the nearly universal affinity of oxygen. Now, if a form of matter should exist a little further removed from the sphere of affinity than nitrogen, its atoms would remain uncombined, and consequently would not come within the sphere of our sense. Or if we could conceive of matter with a gravitating capacity as much lower than hydrogen as hydrogen is below mercury, and if both these qualifying properties should meet in the same form of matter, they would remove it wholly beyond the cognizance of our senses, and we could acquaint ourselves with its existence only by the deductive process.

We find the electric form of force following the same law of unequal influence on different forms of matter. The spark from a battery will almost instantly polarize the atoms of copper composing the cable that stretches from shore to shore across the broad Atlantic, but the same charge will not polarize a rod of glass an inch long. The magnetic modification of electric force is even more select than this in the range of matter subject to its influence.

From these considerations, we at least raise the presumption that there is a form of matter that lies beyond the influence of force in any of its usual modes of action, or it retains only the susceptibility to force in the form of light which causes it to vibrate under that influence. Such matter would consist of primordial atoms, over which the chemical force exerts no power to form molecules, and of which gravity cannot form bodies. A diffusion of such matter through space would result in a quiescent state, a motionless abyss, subject only to the undulations of the luminous wave.

There are some things that are known to us only by the process of mental deduction; and yet the knowledge thus acquired is as real, and our assurance of its truth as strong, as though it had reached us by the grosser avenue of our senses. That the interstellar space is filled with matter is a truth of this kind. The "luminiferous ether" is not a philosophical assumption, a mere conjecture, but its existence rests on the same basis of mental deduction that sustains the truths of mathematics. If light is vibratory motion, a wave that reaches us from the remotest fixed star, then it is evident that there is not an inch of that almost infinite space that is not filled with matter; for vibratory motion demonstrates the existence of vibrating matter.

If we fall back on the corpuscular theory of light as taught by Newton, we have only changed the name of quiescent matter, but have not in the least affected the fact of its universal diffusion through space. But this infinite ocean of undulatory matter is not subject to the chemical, gravitating, nor cohesive forms of force, else, under these influences, it would proceed to form molecules, and these would collect in nebulæ and finally resolve themselves into suns and planets.

So, from matter being universally subject to the chemical forces, it is probable that the ordinary forces act on only an infinitesimal fraction of matter; the great mass remaining quiescent in an atomized condition, filling the interstellar space. We conclude: (1.) From the unequal energy with which force acts on matter, we raise the presumption that there may be a fourth state of matter, entirely relieved from the influence of force. (2.) From the phenomena of light, we demonstrate the plenary diffusion of matter through space, subject only to vibratory motion.

METEOROLOGY FOR FEBRUARY, 1882.

THE sum of my observations on the weather for the past month has been as follows: —

Average Thermometer.		Lowest.	Highest.	Range.
At 7 A. M.	22.00°	— 8°	41°	44°
At 2 P. M.	35.57°	17°	50°	33°
At 9 P. M.	27.79°	14°	48°	34°
Whole month	28.45°	— 8°	50°	53°
Second average [1]	28.29°			
Last 19 Februaries	24.68°	18.98° in 1868.	31.38° in 1877.	17.40°
Winter of 1881-82	29.70°	15°	68°	78°
Last 18 winters	24.50°	16.17° in 1867-68.	31.68° in 1879-80.	15.51°

[1] Found by adding the average evenings *twice*.

The average barometer for the month was 29.995 inches, the lowest 29.25, on the 5th, and the highest 30.54 on the 18th, a range of 1.29 of an inch. The sum of the daily variations was 9.62 inches, giving an average daily movement of .343 of an inch. The average for the last 10 Februaries has been 29.9097, the lowest 29.430 in 1873, and the highest 30.138 in 1876, a range of .708 of an inch.

The face of the sky in 84 observations gave 50 fair, 7 cloudy, 17 overcast, 2 rainy, and 8 snowy. Thus three fifths of this winter month were fair. The amount of rain and 19 inches melted snow (almost entirely snow) was 2.45 inches, while the average for the past 14 Februaries has been 4.18 inches. The lowest amount, .55, was in 1877; and the highest, 6.96, in 1878.

The direction of the wind, in 84 observations, gave an excess of 16 northerly and 58 westerly over the southerly and easterly, indicating approximately the prevailing direction to be west 15° 25′ north. The average direction for the past 13 Februaries has been west 27° 5′ north. In only one instance (1875) during this time has there been a prevailing southerly direction, and then but very slight.

The heavy snow-fall on the last day of January was quickly followed, on the 4th and 5th, by another nearly equal, each averaging full twelve inches on the level, but so light as to yield only about one inch of water each. These storms, with the small amount of snow previously on the ground, increase

the average depth to 25 or 30 inches, an unusual amount for this region. This last storm, coming chiefly on the Sabbath, with fierce winds, filled all the streets and closed the church-doors on that day more effectually than is remembered for many years. Yet so light was the snow, and so high the average temperature (35.5°) for the ten days following the 7th, that, without rain, it was so far wasted as to spoil the sleighing. On the 21st another snow of 5 inches fell, but more moist and solid, yielding over an inch of water, and restoring the sleighing for a few days.

The temperature of the month was the highest, with two exceptions, for the last 19 years. In 1877 it was 31.38°, and 30.68° in 1880. The warmest day (13th) averaged 46.33°, and the coldest (4th) only 12°. The highest range (25°) was also on the 4th, and the lowest (9°) on the 1st and 13th.

With December the warmest for 18 years, February the warmest, with only two exceptions, and January some degrees above the average, we are not surprised to find the entire past winter to be the warmest, with a single exception, for 18 years. (In 1879–80 the average was 31.68°.) In December there was no sleighing; but in January and February, about three weeks each, some of which was excellent. There has been 54 inches of snow. It is curious to observe in the above table how close the average of the past 19 Februaries agrees with the average of the last 18 entire winters, making February the average standard of temperature for the winter. It has varied only .13 of a degree.

MONTHLY COMPARISON OF THE BAROMETER FROM 1873 TO 1881, AND OF THE RAINFALL FROM 1869 TO 1881.

	1.	2.	3.	4.	5.	6.	7.
	Barometer.					Rain.	
Month.	Average in 1881.	Average, last 9 years.	Lowest in 9 years.	Highest in 9 years.	Range in 9 years.	In 1881.	In last 13 years.
Jan.	29.975	29.954	29.05	30.50	1.52	6.10	3.90
Feb.	30.040	29.900	28.84	30.74	1.90	3.40	4.31
March	29.962	29.873	29 00	30.55	1.55	5.52	5.57
April	29.776	29.815	29.00	30.42	1.42	1.92	4.32
May	30 001	29.931	29.42	30.38	.96	2.90	2.70
June	29.853	29.911	29 44	30.20	.76	4.90	3.10
July	29.891	29.914	29 49	30.20	.71	2.95	3.19
Aug.	29.972	29.954	29.60	30 26	.66	.87	4.33
Sept.	30.021	30.019	29.18	30 32	1.14	2.15	2.31
Oct.	30.091	29 964	29.30	30.52	1.12	2.30	4.25
Nov.	30.059	29.970	28.70	30.52	1.82	4.05	4.13
Dec.	30.025	29.933	29.03	30.60	1.57	5.93	3.55
Average	29.944	29.929	29.17	30.43	1.26	42.89	45.66
Highest	30.091	30.019	29.60	30.74	1.90	6.10	5.57
Lowest	29.776	29.815	28.70	30.20	.66	.87	2.31
Range	0 315	0.204	0 90	0.54	1.24	5.23	3.26

In the above table the barometer is seen to exhibit considerable variety, though the average by the month is quite small, and especially where several years are compared. If we compare the highest and lowest single observations in each month for the 9 years, as shown in the 3d, 4th, and 5th columns, we notice large variations, ranging from .66 of an inch in August to 1.90 in February; or, taking the range of the entire 9 years, it amounts to (30.74 — 28.70 =) 2.04 inches. But if we compare the monthly observations of a single year (column 1), we find the range only .315 of an inch; and of 9 years (column 2) only .204 of an inch.

We may notice, also, a tendency to a low barometer in March and April (column 3) and a high one in September, if not in the autumn months generally. But these observations are not perhaps sufficiently extended to establish such a theory. Yet as high or low waves are constantly passing over the entire country, we may expect some localities, from their peculiar situation, to receive generally a higher or lower pressure than certain others; hence these variations.

Another striking feature is shown in column 5. During the four middle months of the year the range of the barometer is very small, averaging only .77 of an inch, while the first four months average 1.60, and the last four 1.41; February and November being the extremes on one side, and August on the other.

The 6th and 7th columns show a much greater variety in the rainfall. We see that no one year can establish a general principle, and even the above 13 years give only an approximate standard. From this, however, March is clearly the banner month, while September falls at the other extreme. It is interesting to note that these extremes occur in the equinoctial months. Still longer observation may modify the above, and possibly change one or both these extremes to a different month. The last year's rainfall came short of the average by 2.67 inches, and yet January and December both exceeded the banner month, while August and April were the two lowest months, though usually standing high, next to March. Hence the great variety was combined with a general uniformity. D. W.

NATICK, *March* 2, 1882.

ATOMS.

THE population of London nearly equals that of New York, Philadelphia, St. Louis, Chicago, and Boston combined. — It is said that two professors of chemistry in Zurich have discovered, after much labor, a splendid, gold-like color, which can be applied even on fabrics. — According to Rinman's investigations, the magnetic intensity of iron appears to increase with the increase of carbon. — The European mesmerizer, Hansen, who has been giving *séances* before the medical societies of Austria and Prussia, has been forbidden to hold any more, on the ground that he injures the subjects whom he employs. — An important and hitherto unknown treatise by Copernicus, on the movements of the celestial bodies, has been discovered in the archives of the astronomical observatory at Stockholm. — A family living near Corinth, Kentucky, were recently poisoned (five of them it is thought fatally) by eating corn bread supposed to contain arsenic. — During the year 1881 less foreign wine was imported into Switzerland than in 1880, but the quantity of spirits imported greatly increased. — It is stated by Dr. Billings (U. S. A.) that 100,000 people die annually in the United States from preventable diseases and avoidable accidents. — Recently, at Bern, a medical student cut his finger while dissecting a dead body; precautions were immediately taken to prevent blood-poisoning, but the poor young fellow expired, after much suffering. — Mr Erasmus Wilson, President of the Royal College of Surgeons, England, has received the honor of knighthood, in consideration of his numerous gifts to charities, etc. — A colossal oak-tree was recently felled near Ollon, in the Canton of Vaud, the circumference of which, measured some 19 inches above the roots, was no less than 20 feet, while its weight was considerably over 3 tons. — False ipecacuanha is distinguishable from the pure drug by being more branched, by its dirty white color, and by the absence of the annular rings present in the genuine article. — The *Scientific American* mentions a recently patented device for extinguishing kerosene lamps, which consists of a shut-off for the air supply, the action becoming automatic if the lamp is overturned. — Our venerable friend Mrs. Partington says that "Ike has an irrigating disease: Charlotte russe broke out all over him, and if he had n't worn the Injun beads as an omelette it would doubtless have calumniated fatally."

LITERARY NOTES.

Eczema and its Management is the name of a recent important addition to the literature of a disease which is perhaps the most troublesome of any that comes under the notice of physicians. The author, Dr. Duncan Bulkley, A. M., is well known as a specialist in the treatment of eczema, and an authority upon the subject. His book is the result of many years' study and experience; his experience having been had not only in the hospitals of this country, but in those of Europe. Dr. Bulkley is a believer in the constitutional origin and relations of eczema, and is an advocate of forms of constitutional as opposed to purely local treatment. The volume should be in the library of every physician, as one to be consulted in a class of skin diseases which have baffled treatment under ordinary means for many years. The price of the volume is $2.50, we believe, and it can be had of all medical booksellers throughout the country. Messrs. G. P. Putnam's Sons, of New York, are the publishers.

The *Transactions of the American Medical Association*, Vol. 32, 1881, contains the papers read at the Richmond, Va., meeting in May last. Some of these are very valuable, especially the one on "Cellars," by Dr. A. N. Bell.

The Use of Tobacco is the title of an excellent little monograph by Prof. J. I. D. Hinds, Ph. D., of the Cumberland University, Tenn. We recommend it to the attention of smokers and others for the valuable information it contains and the fairness with which the subject is treated.

We have received from M. L. Holbrook & Co., New York, a book entitled *Marriage and Parentage*. The design of the book is to show how the race can be improved by wiser and more sanitary marriages, and by more physiological parentage.

The Constants of Nature, Part V., contains a recalculation of the atomic weights, by Prof. S. W. Clarke. It forms No. 441 of the Smithsonian Miscellaneous Collections, and contains 280 pages of valuable matter.

The fourth *Annual Report of the Connecticut State Board of Health* contains many subjects of popular as well as scientific interest, and is illustrated by several maps and diagrams.

We are indebted to Messrs. Ginn, Heath & Co., of this city, for the following numbers of their little "Guides for Science Teaching:" No 1, *About Pebbles*, 16mo, 26 pages, is by Prof. Alpheus Hyatt; No. 2, *Concerning a Few Common Plants*, 16mo, 61 pages, is by Prof. George Goodale; No. 3, *Commercial and other Sponges*, 16mo, 43 pages, is by Professor Hyatt; No. 4, *A First Lesson in Natural History*, 64 pages, is by Mrs. Elizabeth Agassiz; No. 5, *Common Hydroids, Corals, and Echinoderms*, 32 pages, by Professor Hyatt; No. 6, *The Oyster, Clam, and other Common Molluscs*, 65 pages, by Professor Hyatt; No. 12, *Common Minerals and Rocks*, 128 pages, by Wm. O Crosby. These little books are not intended as text-books or lecture-notes, but merely as aids to the teacher in conducting a course of "object lessons in science."

Incandescent Electric Lights forms the title of No. 57 of Van Nostrand's Science Series. Particular reference is made to the Edison Lamp at the Paris Exhibition, and no more flattering notice of this inventor could have been written if dictated by the sage of Menlo Park himself. It will be read, however, with much interest by all who believe, as we do, that the true solution of the electric-light problem is to be found in the use of some form of incandescent lamp.

We are glad to see that Van Nostrand has also put forth a second and revised edition of *Sewer Gases, their Nature and Origin, and how to Protect our Dwellings*, by Adolfo de Varona, A. M., M. D. Too much cannot be said and done to enlighten people on the dangers of this insidious poison.

Blakiston, Son & Co. have issued a cheap edition, in paper, of Dr. Wm. H. Day's valuable treatise on *Headaches, their Nature, Cause, and Treatment*, which should be carefully read by every intelligent person who suffers from headaches; and who does not? In our March number we gave our readers some of Dr. Day's views in regard to the treatment of nervous and neuralgic headaches.

Vaccination is the title of a very timely little book by Joseph F. Edwards, M. D.; Blakiston, Son & Co. It contains various arguments *pro* and *con*, and concludes with a chapter on the Hygiene of Small-Pox.

The *Photographic Times and American Photographer* is a handsomely printed monthly magazine, edited by J. Traill Taylor, and published by the Scovill Manufacturing Co., New York.

La Toscana Industriale e Agricola is the title of an Italian monthly that reaches us from Prato, Tuscany. It is edited by Prof. P. E. Alessandri.

The *Southern World* is the title of a new agricultural paper recently started in Atlanta, Ga. It is well edited, and deserves the support of the farming community in the new South.

The *Southern Dental Journal* is another new literary venture, also from Atlanta, edited by B. H. Catching, D D. S

The following pamphlets have also been received: —

Preliminary Observations on the Pathology of Sea-Sickness, by J. A. Irwin, M. D.: Philadelphia, Blakiston, Son & Co.

Trance and Muscle Reading, by G. M Beard, M. D.

The Trance State in Inebriety, its Medico-Legal Relations, by T. D. Crothers, M. D.

Report of the Bureau of General Sanitary Science, Climatology, and Hygiene, Pittsburgh, 1881.

Drug Attenuation, by J. P. Dake, M. D., Nashville, 1881.

Annual Report of the Connecticut Agricultural Experiment Station for 1881.

Medicine and Pharmacy.

OPIUM SMOKING IN AMERICA.

THERE can be no doubt that the vice of opium smoking is rapidly increasing in this country. When Dr. H. H. Kane published his book entitled "Drugs that Enslave," a few years ago, he remarked in it that this form of the opium habit was confined entirely to Eastern countries; but he now brings out a little treatise on "Opium Smoking," in which he asserts that "the practice, comparatively unknown amongst us six years ago, is now indulged in by some six thousand of our countrymen, male and female, whose ranks are becoming daily recruited from the over-curious, foolish, indolent, or wilfully vicious." In some of the States laws have already been enacted imposing heavy penalties upon both the seller and the smoker.

The spread of the evil habit is very strikingly shown by the increase in the imports of smoking-opium; for the drug as used for this purpose is a specially prepared form, on which the duty is $6.00 a pound, that on ordinary opium being only $1.00 a pound. The amount imported in 1880 was 17,000 pounds more than in 1879, or a total amount of 77,196 pounds, valued at about two thirds of a million of dollars. The increase is not due, as might at first be supposed, to Chinese immigration; for the number of Chinese in the country has remained nearly stationary since 1876.

It should be understood that this is the testimony of a careful and conservative writer, who is endorsed by the best medical authorities, and who is himself righteously severe upon the exaggerated statements made by certain over-zealous people in regard to both the extent of the practice and the mischief it is doing. Dr. Kane believes it to be the least injurious form of the opium habit, which in every form is an insidious and terrible evil. Compared with other ways of using the drug habitually, "it takes longer to form a real habit, it works less physical and mental injury when once formed, and it is much easier to cure;" *but*, "viewed from any stand-point the practice is filthy and disgusting, it is a fertile cause of crime, insanity, and suicide, a poison to hope and ambition, a destroyer of bodily and mental functions, and a thing to be viewed with abhorrence by every honest man and virtuous woman."

Yet the practice has not been without its defenders. Within a few months, Dr. George Birdwood, who has been a professor in a medical college and has held important government offices, has written to the London *Times* as follows: —

As regards *opium smoking*, I can, from experience, testify that it is of itself absolutely harmless. I should like those who have been led to believe, on the unscientific observations of others, that it is harmful, to simply try it experimentally for themselves, under proper precautions, of course, against the risk of using the imperfectly prepared *chandu* or "smokable extract" of opium. I feel satisfied that the more thoroughly they test it, the more strongly will they be convinced with me that the smoking of opium is of itself a perfectly innocuous indulgence. I have known cases of desperate suffering, resulting apparently from excess in opium smoking, such as unscientific observers hold up, *in terrorem*, before the British public. But these cases were always of moral imbeciles who were addicted to other forms of depravity, and the opium pipe was merely the last straw laid on their inherently enervated and over-strained backs. . . . No one will deny that, at all events in tropical countries, the effects of excess in ardent spirits are worse than those of opium, and it would be unfortunate, indeed, if, as a consequence of the abolition of the government manufacture of opium in India, the Chinese were led back to the use of the ardent spirits of their own baneful distillation. It would be the undoing of probably the greatest temperance triumph of any age or country. . . . Alcohol acts with doubly destructive force in tropical climates, and with awful rapidity, and its victims are a constant danger to others; whereas, the sufferers from the abuse of opium are seldom dangerous to others, and are a nuisance only from lingering so long in a state of harmless dulness on the hands of their relations.

The latter part of this extract is perhaps a sufficient comment on what precedes. As a choice of evils, in a tropical climate, opium-smoking may be preferable to the drinking of spirits. It is doubtless true, also, as with the latter habit, that many persons may be able to indulge in it moderately without becoming a slave to it and suffering the consequences of such base bondage; but this does not justify a writer in calling either habit "a perfectly innocuous indulgence." The Chinese government has evidently been wise in trying to check the spread of the opium habit in all its phases; and in our own country it may become necessary for other States to follow the example of California and Nevada, in making the vice a subject of penal legislation.

OVERWORK IN SCHOOLS.

MUCH has been written of late years concerning "high-pressure education," and especially with reference to girls in our public schools. Both sides of the question have been ably presented. On the one hand, it has been urged that too much is exacted of the pupils, who often become victims to the desire for knowledge as completely as Adam and Eve did in the Biblical garden. They are crammed with the fruit of the tree of knowledge until hopeless ruin is the result. If they escape with nothing worse than chronic mental dyspepsia they are lucky. On the other hand, it is maintained that the actual demands on mind and body in our educational system are moderate and reasonable, and that the mischief which is ascribed to the school is rather to be attributed to faults in home training, and to additional burdens imposed upon the young student in outside pursuits, — music, drawing, needlework, and the like, — or of social amusements, which, though they pass for recreation, are really hard and wearing labor.

Of course both sides, as in the majority of such disputes, are partly right. The mere demands of the average school *curriculum* upon the average mental power of boy or girl are not excessive. If school work is viewed as the regular employment of the pupil for the time, which is to be attended to on strictly "business principles," it is not likely to be too severe a strain upon boys and girls of ordinary capacity in fair health. It is not too much, but it must be borne in mind that it is *enough*; and the occupations of the pupil for the remainder of his time must be regulated accordingly. The man who has the work of a trade or profession to do cannot, as a rule, attempt much other work; and the same is true of the school-boy or school-girl. The surplus time must be given either to play, or to such employment as is practically equivalent to play or recreation. To burden the pupil with outside studies, or with domestic duties that weary and worry instead of giving a refreshing change of activity to body and mind, is as bad as making the tired artisan or business man do a second day's work when his regular "stint" is finished; or rather, it is worse, for the young laborer is less able to endure the double strain upon his powers.

On the other side, it should be kept in mind that the real strain of school upon the pupil is not fairly measured by the amount of work viewed simply as work. This, indeed, is often — and in the case of girls we may say is generally — the least important element in the strain. The ordinary school course involves not only mental effort, but nervous tension, anxiety as well as work; and this *worry*, which is not put down in the "course of study," and which is not measurable or even recognizable by the usual school tests, is far more mischievous than the work. It is an unknown but constant quantity in the problem which materially affects the final result.

It is unfortunate that much of the school machinery is specially adapted to increase this nervous tension in the pupil. The daily "marks" for recitations, the frequent written examinations, the annual "promotions" depending upon marks and examinations, the classification according to rank, — all tend to keep the scholars in a state of chronic excitement and anxiety, which is a severe strain upon the nervous system.

Girls suffer from this far more seriously than boys. They often work much harder than their brothers, and they worry infinitely more. They are generally more ambitious and more conscientious, more sensitive in regard to "rank," and more "nervous" about all their duties and relations in school. Not unfrequently they carry something of this nervous excitement into their very recreations. The school-girl who has had the hygienic importance of "exercise" impressed upon her often sets about it as a regular task, and is worried lest she should do too little or too much. The boys, who fling all school cares aside when once out of doors, and throw their whole souls into their sports, as they may or may not into their studies, have a great advantage here over their sisters.

But it is not the school-girls alone who are liable to be the victims of our educational system. In an able paper in the *Boston Medical and Surgical Journal* for March 9th, Dr. Robert T. Edes calls attention to the fact that so many cases of "nervous prostration," or "neurasthenia," as it is now the fashion to call it, occur among female teachers. Of ten patients under his own care "whose cases may fairly be named 'nervous exhaustion,' seven had been teachers," certainly showing that "teaching is *one* way of breaking down nervous strength." Women are more liable to this breaking down than men, just as school-girls are more liable to it than school-boys, and for similar reasons. They worry more over their work than men do; are less ready to spare themselves when they begin to feel exhausted, and more obstinate in keeping at

work when really unfit for it. As Dr. Edes remarks, though at first it seems paradoxical, "the break-down of many women is owing to their superior powers of endurance; that is, of endurance for a time, under nervous excitement." Of course, when the collapse finally comes, it is only the more complete and disastrous.

So far as the *work* of these teachers is too hard for them, it is largely due to the needless and ever-increasing complexity of the school machinery, the minute "marking" of recitations, the recording and averaging of the "marks," the many written examinations with the correcting and marking of the same, to say nothing of other written exercises, compositions, etc. The amount of this written work in schools has been enormously increased in recent years. It has its value, but it may be a question whether the thing is not overdone. At any rate, it makes a heavy addition to the work of the teacher out of regular school hours.

Among the causes of *worry*, the limited and uncertain tenure of office is to be noted, and this is apt to trouble the female teacher more than the male. Her sensitiveness and self-distrust as to what she is accomplishing often make her morbidly anxious about the annual election, on which her continuance in her position is dependent. The ignorant or prejudiced judgment of a single "committee man" may turn the scale against an able and faithful teacher when this yearly doomsday comes round. It is a disgrace to our educational system that this source of worry should be added to all the others that wear upon the teacher. The incompetent or unworthy could surely be got rid of without subjecting the whole body of instructors to this annual inquisition.

We cannot but believe, with Dr. Edes, that "our system of education is responsible, both by omission and commission, for an important proportion of the chronic female invalids;" but the remedies, even if they are easily seen, — in part at least, — are not so easily to be secured.

MR. BERGH ON VACCINATION.

Mr. Henry Bergh, not content with his field of operations in the S. P. C. A. of New York, or possibly longing for variety of employment, has come out as an anti-vaccinationist, or, in other words, as an advocate of cruelty to the human animal. His argument, if argument it can be called, in favor of exposing the race to the free sweep of a plague that was the terror of the world until checked by the immortal discovery of Jenner, is so weak and silly that it can hardly do much mischief. It is unfortunate, however, that it should appear in a magazine whose very name is supposed to carry a kind of authority with it.

The *Sanitary Engineer* is none too severe upon the article when it says: —

> The furious anti-vaccination diatribe of Mr. Bergh, in the February number of the *North American Review*, will give rise to feelings of mingled amusement, contempt, and regret in the minds of the few sensible men who will probably waste their time in reading it. The amusement will be at the brassy impudence of his arraignment of the whole medical profession as incompetent and knavish; the contempt will be for the weak and sophistical arguments, based upon false assertions, for which, for the most part, not a shadow of proof, nor a single verifiable reference to any of his so-called authorities, is given; and the regret will be that the *North American Review* should, in its search for sensational articles as a means of making money, have prostituted its columns to such ware as this. Probably the editor would excuse the admission of this stuff on the ground that he was going to get some one else to write a reply, but this is very much like splashing a man with filth to show how completely it can be brushed off after it has dried.

Since the above was in type the *North American Review* for April has been issued, containing a trenchant reply to Mr. Bergh, from the pen of Dr. Henry A. Martin of this city. We can quote only the closing paragraph, which is as follows:

> I have heard of a school that is not
>
> 'any school,
> But that where blind and naked ignorance
> Delivers brawling judgments unashamed
> On all things all day long.'
>
> Is Mr. Bergh, perhaps, one of its recent graduates?

FOOD ADULTERATIONS.

The burglar or the highwayman who robs us of our purse is less a criminal than the assassin who seeks our life. He who poisons our food robs us of the most valuable possession on earth, — our health. Adulteration is robbery, it may be murder. We have little sympathy, however, with the pessimist, who is forever crying "wolf" when there is no wolf, and whose alarm is so frequently groundless that the public soon become indifferent to his warning; and who, having exhausted his vocabulary in reviling small tricks, or describing slight dangers, has no stronger epithets left to use when serious dangers threaten. If we really believed all the representations concerning the poisoning of everything we handle, taste, or wear, life would become a burden to us. If poison lurks on every side, why is the average duration of life slowly increasing?

There are two classes of adulterations: the one is the sale of harmless articles under false names, which constitutes *fraud;* the other, the sale of dangerous and poisonous articles as harmless, which constitutes *murder*.

To add water to wine, to remove the cream from milk, to mix chiccory or barley with coffee, to knead oleomargarine into butter or incorporate grape sugar with cane sugar, to put mill-dust in pepper and flour in mustard, are intentional adulterations, intended to deceive. But they are no worse tricks than selling stale eggs for fresh ones, or cane sugar for maple sugar, or the substitution of cotton in woolen fabrics or linen in silk. They injure the pocket more than the person. They are suitable subjects for judicial interference and legal punishment. Fortunately, there is a remedy, which seldom fails, within the easy reach of most consumers. Pay a fair price, and buy only of men whom you can trust. Commercial honesty is not yet a thing of the past, and the retailer is generally aware of the fact when he sells adulterated goods. If the consumer were as careful in purchasing his groceries, as he is when buying watches or diamonds, to patronize only those in whom he can place full confidence, it would soon be an easy matter to find pure and unadulterated goods.

The other class of adulterations is more dangerous and difficult to deal with. The secret of the contamination is known only to the manufacturer; the amount used is too small, usually, to attract attention, but in nearly every case a chemical analysis is able to settle the question at once; and it is much to be regretted that articles liable to poisonous contaminations are not more frequently submitted to the chemist for examination. We do not believe there is a chemist in the land, worthy of the name, and possessing the diploma of the leading American or foreign universities, who would knowingly endorse a fraudulent article, notwithstanding Dr. Runnel's assertion that "thousands of dollars are paid to prominent chemists every year to sanction the adulteration of food and medicine." We must, however, confess that there are "quacks" in our profession, who are willing to certify that they have *not* found anything injurious in a certain preparation, when the facts are that they either made no tests for injurious substances or are ignorant of the proper means of testing for them.

Probably one of the greatest curses that we live under, one that greatly increases infantile mortality and produces so many invalids, is the reign of patent medicines. For every trifling ailment, the unfortunate victim is dosed with some vile compound, of unknown composition. If the innocent sufferer escapes this danger it is only to encounter several others, namely, to be prescribed for by an ignorant physician, whose prescription is put up by a careless or incompetent druggist from impure drugs, and administered by a thoughtless nurse. The patient dies, not from the disease, but from overdosing and adulterated drugs.

In New York State an effort is being made to repress adulterations of food and drink, and we shall watch with great interest its practical workings, hoping much, but expecting little. H.

FASTING IN ACUTE RHEUMATISM.

Dr. C. E. Page sends us the following note:

Casey A. Wood, M. D., professor of chemistry in the medical department of Bishop's College, Montreal, in an article entitled "Starvation in the Treatment of Acute Articular Rheumatism" (*Canada Medical Record*), gives the history of seven cases where the patients were speedily restored to health by simply abstaining from food from four to eight days, and he says he could have given the history of forty more from his own practice, but thought these would suffice. In no instance did he find it necessary to extend the fast beyond ten days. His patients were allowed to drink freely of cold water, or lemonade in moderate quantities if they preferred, and simple sponging with tepid water was resorted to as indicated by feverishness of the surface. In no case did this treatment fail. No medicines were administered. The cases reported "included men and women of different ages, temperaments, occupations, and social positions." He further says: "From the quick and almost invariably good results to be obtained by simple abstinence from food, I am inclined to the idea that rheumatism is, after all, only a phase of indigestion, and that, by giving complete and continued rest to all the viscera that take any part in the process of digestion, the disease is attacked *in ipsa radice*." In chronic rheumatism he obtained less positive results, but did not venture to try fasts of longer duration. Dr. Wood concludes by saying that "this treatment, obviating as it does, almost entirely, the danger of cardiac complications, will be found to realize all that has been claimed for it, — a simple, reliable remedy for a disease that has long baffled

the physician's skill; and the frequency with which rheumatism occurs will give every one a chance of trying its efficacy."

CARBOLIC ACID IN DIPHTHERIA.

Dr. Z. T. Magill, of Lincoln, Missouri, contributes to the *Chicago Medical Journal* the method of treating diphtheria from which he has secured better results than from any other. He uses an ordinary hose, from three to five feet long and about one inch in diameter. One end is placed over the spout of a common tea-kettle, into which has been put half a gallon of water and half an ounce of carbolic acid. The kettle is then placed on the stove, over a good fire, and when the water reaches the boiling point the free end of the hose is carried under a blanket thrown over the patient's head. The room must be closed. In a short time the patient will perspire freely. If persevered in at short intervals, breathing becomes softer, and presently, after a succession of quick expulsive efforts, the patient throws off a coat or tube of false membrane. The acid vapor seems to prevent the re-formation of exudation. Alcohol and sulphate of quinine are used in conjunction with the acid, for their supporting properties.

MISCELLANEA.

Solvent for Gallic Acid. — A correspondent of the *British Medical Journal* says that he has accidentally discovered a method of dissolving gallic acid. Having, a short time since, a case of hæmaturia, the result of uric-acid gravel, he chanced to prescribe a mixture containing half a drachm of gallic acid and a drachm and a half of citrate of potassium, and to his surprise he found he had a perfectly clear liquid, the gallic acid being completely dissolved. He has since made further experiments, and he finds that, with care, twenty grains of citrate will dissolve as much as fifteen grains of gallic acid in an ounce of water, and remain quite clear for any length of time. To be able to give gallic acid in perfect solution is a great advantage, as absorption must take place more rapidly when the acid is in solution than when simply suspended in mucilage. The citrate, being a very simple salt, can do no harm in any cases in which gallic acid is required. The only means of dissolving gallic acid for medicinal use heretofore known by Mr. Long have been alcohol and boiling water, both of which are practically useless.

Food for Infants. — A committee of the New York State Medical Society, in a recent report, recommend that there should be stores in the city where the poor can obtain wholesome food for children at reasonable prices. A supply of milk should be brought to the city twice daily for these children, and they advise that it should be boiled, or that bicarbonate of soda should be added to retard souring. For food they recommend powdered barley or oatmeal, sugar, milk, and eggs, and give the following directions for their use: Powdered barley, a package of one half pound to a child under one year of age every week; two such packages for a child of from one to two years of age. When oatmeal is required it may be supplied in the same quantity as barley. Eggs, 7 a week for a baby a year old or less; 14 a week for a baby over a year old. Sugar, half a pound a week. Milk, 12 ounces for a baby under a year twice daily; 20 ounces for a child over a year twice daily. The committee strongly condemn the use of the patented foods for infants, of which there are so many on the market.

A Martyr to Science. — Eugene Boutney, who discovered and investigated the alkaloids generated in corpses after death, the ptomaines, died recently from a carbuncle caused by his having absorbed some of the very poisons which formed the objects of his researches.

Mixture of Anæsthetics. — The Vienna mixture, under the use of which 8000 operations have been performed without a single accident, consists of three parts of ether and one of chloroform; and Billroth's favorite mixture is composed of three parts of ether, one of chloroform, and one of alcohol.

The Medical Student's Primer. — What place is this? This is the Pathological Society. How does one know it is the Pathological Society? You know it by the specimens and the smells.

What is that on a plate? That is a tumor. It is a very large tumor. It weighs one hundred and twelve pounds. The patient weighed eighty-eight pounds. Was the tumor removed from the patient? No, the patient was removed from the tumor. Did they save the patient? No, but they saved the tumor.

What is this in the bottle? It is a tapeworm. It is a long tapeworm; it is three quarters of a mile long. Is that much for a tapeworm? It is indeed much for a tapeworm, but not much for the Pathological Society.

How to give a Savage Dyspepsia. — An English physician, with whom Sydney Smith was always in a controversial state, accepted a professional call to Australia in its early savage days. When taking leave of him the wit said, "Good-by, doctor: you have never failed to disagree with me, and I believe you will disagree with the savage who eats you."

SELECT FORMULÆ.

Crystalline Pomade. — The following is from a Russian pharmaceutical journal: —

	Parts.
Finest olive oil	2,500
Spermaceti	550
Oil of bergamot	50
" neroli	10
" cloves	30
" oranges	50

Almond Meal. — The following formula is recommended in the *Magazine of Pharmacy* for this useful cosmetic: —

Almond meal, in fine powder, prepared from blanched bitter almonds, after the oil has been extracted	6 oz.
Orris root, in fine powder	4 "
Wheat flour	4 "
White Castile soap, in fine powder	1 "
Borax, in fine powder	1 "
Oil of bitter almonds	10 drops.
Oil of bergamot	2 drachms.
Tincture of musk	1 drachm.

Mix thoroughly, and pass the mixture through a fine sieve.

Hair Tonic. — J. M. Frey, in *Medical Brief*, says he has used the following successfully for falling hair after fevers: —

Zinci sulph.	10 gr.
Quiniæ sulph.	20 gr.
Tinct. cantharides	1 oz.
Bay rum	2 oz.
Glycerine	2 oz.
Water	2 oz. M.

To be brushed or rubbed into the scalp, with much gentle shampooing.

Simple Continued Fever. — Dr. Fothergill, in speaking of the following formula, says it will probably constitute, *par excellence*, the fever mixture of the future: ℞. Acid. hydrobrom., ʒ i.; Syr. simplicis, ʒ ij.; Aq. ad. ℥ i. M. Sig. Every hour. It is especially indicated where there is cerebral disturbance.

Application in Inflamed Conjunctiva. — A correspondent of the *Louisville Medical News*, describing a visit to the Manhattan Eye and Ear Hospital, New York, supplies the formula of a solution in very common use there for inflamed conjunctiva; it is used with an atomizer in the form of spray: Tannin gr. x., sodæ bicarb. gr. xx., glycerin. ʒ ij., aquæ Oij.

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Special Notices.

Send a Postal Card to the Grant Revolving Filter Company, 30 Central Street, Boston, for their celebrated Filter, which took the highest prize at the Mechanics' Fair in competition with the Crocker Filter.

GOOD WORDS FOR ADVERTISERS.

Chemists and Pharmacists will be interested in reading the annual announcement of the Massachusetts College of Pharmacy, which can be found on page 6 of our advertising columns. The College is early in the field for new students, and by being thus early it will enable all who wish to make their arrangements in season to attend the courses of the only School of Pharmacy in New England, and second to none in the country for thorough and systematic instruction. All interested are invited to attend the Graduating Exercises, which will be held during the coming month.

The Feeding of Infants — This subject was discussed at the one hundred and twelfth annual meeting of the Medical Society of the State of New Jersey, at Spriug Lake, New Jersey, May 28 and 29, 1878. Special report for the *Medical Record*, Vol. 13, No. 23. Extract from the Reports: "Answers to this question differed with the residence of the physician — the country and city manifesting each its peculiar needs. The mother's milk is generally conceded to be the best for the infant, but even when this is abundant, it may be disadvantageous for the individual living on it, and a substitute be necessary. Country practitioners recommend cow's milk as the best substitute, while many in cities and towns speak highly of condensed milk. Of the preparations so various and so highly commended by those who put them on the market, the Imperial Granum seems to hold the first place in the estimation of medical observers. All agree in condemning the use of nursing-tubes as unclean, even with the best of care."

Horsford's Acid Phosphate in Nervous Exhaustion. — I have used Horsford's Acid Phosphate in nervous exhaustion, and in nervous disturbances connected with an overworked brain, and am satisfied that it is a remedy of great service in many forms of exhaustion.

St. Louis, Mo. S. T. Newman, M. D.

We call the attention of our readers to the advertisement of Eimer & Amend on page 4. This old and reliable house have recently added to their stock a complete assortment of chemical glassware, and are able to furnish schools and laboratories with complete sets of apparatus for demonstration and analysis. Merck's chemicals always on hand.

Cephaline is a special Nerve Food, not a "Cure-All." It relieves all *Nervous Diseases*.

Verbum sat sapienti, and that word to your Stationer will be an order for a box of Esterbrook's Celebrated Steel Pens.

We ask the attention of our readers to the advertisement of Richards & Co. on page 5, of their Silicated Carbon Filter, as anything in regard to the purity of water is valuable at this time.

GOOD WORDS FROM SUBSCRIBERS.

Springdale, Miss., *Dec.* 12, 1878.

Dear Sirs, — Inclosed find postal money-order to pay for the Journal of Chemistry to January 1, 1884; and I will say to you that the Journal has been very interesting to me, and the payment will last me till I am seventy-five years old, if I live to that time; and with this I tender to you my thanks

Yours most respectfully,

Dr. F. G. Shipp.

Boston Journal of Chemistry
AND
POPULAR SCIENCE REVIEW.

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Familiar Science.

COMETS AND METEORS.

II.

"SHOOTING-STARS" are familiar objects in the nocturnal sky. If any one thinks them to be rare, it is because he keeps his eyes on the earth instead of looking up to the heavens. If he is on the watch for them he will seldom have to wait many minutes without seeing one. The average number visible to the naked eye at one place is estimated at about a thousand an hour; and the average number large enough to be thus visible, that traverse the atmosphere daily, is reckoned at more than eight millions; and this is probably a very small fraction of the whole number.

Occasionally these bodies are brilliant enough to light up the whole heavens, and then we call them *meteors;* though this term is equally applicable to ordinary shooting-stars. Sometimes they are seen to break in pieces, with or without an audible noise; and now and then meteoric stones, or *aerolites*, fall to the earth. These generally come with great velocity, and if examined soon after their descent are found to be warm, or even hot.

During the last sixty years there have been eighteen well-authenticated instances of this fall of aerolites, and their aggregate weight is about twelve hundred and fifty pounds. The whole number of such aerolites, the date of whose fall has been known, is two hundred and sixty-one; and there are seventy-four other cases, the date of which is more or less uncertain. There have also been found eighty-four masses which are known to be of meteoric origin, though no one saw them fall. The weight of these masses varies from a few pounds to several tons.

Aerolites are composed of the same elementary substances that occur in our terrestrial minerals. Of the sixty or more elements now recognized by chemists, about twenty have been found in these meteoric bodies, but not a single new element has been detected in analyzing them. At the same time, the appearance of aerolites is peculiar, and their composition differs so entirely from that of all terrestrial substances that we can have no doubt of their meteoric origin.

Iron, for example, is very abundant on the earth, but it is almost invariably found combined with other elements. Metallic iron is one of the rarest things in nature. Now, these aerolites invariably contain metallic iron, and sometimes from ninety to ninety-six per cent. of it. This iron is malleable, and may be readily wrought into cutting instruments. It almost always contains from eight to ten per cent. of nickel, together with small quantities of cobalt, copper, tin, and chromium. This composition has never been found among the countless forms of terrestrial minerals. A peculiar compound of iron, nickel, and phosphorus is also found only in meteoric stones.

Certain other characteristics of these strange bodies are equally unmistakable. Meteoric iron has a peculiar crystalline structure which the ordinary metal never assumes. If the surface of a piece of meteoric iron is polished, and the mass is then heated to a certain temperature, the surface becomes covered with parallel lines crossed by others at angles of sixty degrees, the whole forming a comparatively regular network. The same figures can be developed on the polished surface by the action of nitric acid. Nothing resembling this can be produced on ordinary iron; though it is said that iron melted directly out of certain volcanic rocks has been made to

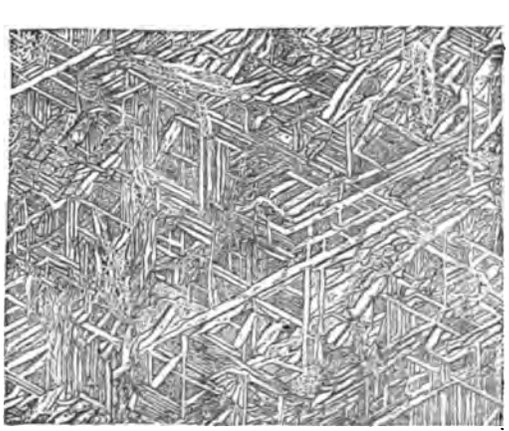

Figure 1.

exhibit these "Widmannstäten figures" (see Figure 1), as they are called from the Austrian ironmaster who first detected them.

What are all these mysterious bodies, these shooting-stars, meteors, and aerolites, that are seen flying through our atmosphere or descending from it to the earth? It is only within a few years that their nature has been well understood. It was once thought by scientific men that they might have been thrown from volcanoes on the earth; but the velocity with which they descend and their peculiar composition unite to refute this theory. It has been suggested that they may come from volcanoes on the moon; but this view also has been shown to be untenable. Our limits forbid us to go into particulars; suffice it that these old theories are now as thoroughly exploded as the Ptolemaic system of astronomy.

The opinion of all astronomers now is that these meteoric bodies, whether large or small, revolve, like the comets, round the sun. They are moving in every possible direction through the celestial spaces, and our earth, as she travels her yearly route, is continually running across their orbits. They are invisible until they plunge into our atmosphere, but the resistance of the air checks their speed and converts a part of their energy of motion into that of heat. This heat is sufficient in the case of small meteors to burn them up, or to dissipate them in vapor, giving rise to the phenomena of shooting-stars. If the meteor is large enough and refractory enough to resist the heat to which it is exposed, its motion is sufficiently arrested, on entering the lower strata of the atmosphere, to cause it to fall to the earth as an aerolite. A brilliant meteor differs from a shooting-star only in magnitude.

The meteors which are seen on ordinary nights are only the stragglers of the innumerable host. Their orbits lie in all directions, and are apparently scattered at random. But at certain times in the year shooting-stars are far more numerous, and are observed to move in a common direction. These *meteoric showers*, as they are called, vary greatly in brilliancy; but during any one shower the meteors all appear to radiate from some one point in the heavens. If we note their paths carefully, we shall see that they can all be traced back to this *radiant point*, as it is termed. It is evidently far beyond our atmosphere, for it always appears in the same position, wherever the observer may be, and does not partake of the diurnal motion of the globe. As the stars move westward, the radiant point moves westward with them. We soon see that the point is merely an effect of perspective, being the "vanishing point" of the parallel lines in which the meteors are actually moving. From the apparent motion, as in the case of other heavenly bodies, we are able to deduce the real motion; and thus the shape of the orbits in which the meteors are travelling is determined.

One of these meteoric showers, though not a very brilliant one, occurs annually about the 10th of August. The radiant point is in the constellation Perseus, and hence these meteors are often called the *Perseids.* Their orbit has been quite accurately made out. Its perihelion, or point nearest the sun, is at about the distance of our planet

from that luminary, and near the part of her orbit which she reaches in August. The other extremity of the long ellipse which the meteors traverse is millions of miles beyond the orbit of Neptune, the most distant planet of our system that has yet been discovered. The meteors seem to be scattered pretty uniformly along this immense path, which it probably takes them more than a hundred and twenty years to travel; for every time the earth comes round to the intersection of her orbit with theirs, she runs across about the same number of them. The meteoric shower is as brilliant one year as another.

A brighter shower of the kind occurs every year about the 13th of November. Its radiant point is in the constellation Leo, and on this account the meteors are known as the *Leonids*. Their orbit has also been determined with considerable precision. Its perihelion is near the orbit of the earth, while its aphelion (or farthest point from the sun) lies a little beyond the orbit of Uranus; and the periodic time is about thirty-three years. But the meteors, instead of forming a comparatively uniform stream along the whole path, are mainly in one large group, — so large that it takes two or three years to pass the perihelion point. Of course when the earth runs across this crowd of meteors we have a shower of extraordinary brilliancy, and this may occur for two or three years in succession. For the remainder of the thirty-three years, we shall encounter only the stragglers of the vast meteoric army, who are scattered along the entire line of march. The last great display of these meteors was in 1866 and 1867, but it was visible in this country only a short time before sunrise, and therefore attracted less attention than the remarkable shower of 1833, which some of the oldest of our readers may remember. The orbit is shown in Figure 2. That of the August meteors is an ellipse more than twice as long.

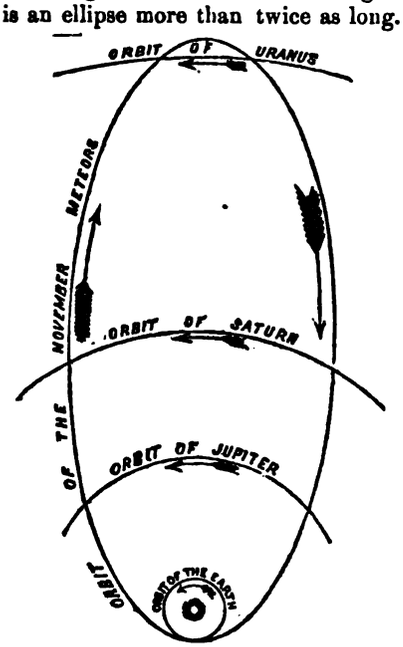

Figure 2.

The orbit of the November meteors was determined in season for the prediction of the great shower of 1866, and the study of this shower led to the interesting discovery of a remarkable relation between meteors and comets, which has since been confirmed by evidence drawn from other meteoric showers. When the elements of the meteoric orbit were accurately determined, it was found that they corresponded so closely in every particular with those of the orbit of a small comet discovered in 1865 that there could be no possible doubt that meteors and comet are related bodies. The meteors are nothing more than fragments of the comet scattered along its pathway; or the comet may be said to be the "boss" meteor of the immense group.

But a detailed explanation of the relations between the two must be left to another and final article.

TOBACCO.

The world is indebted to America for two great agricultural products, tobacco and Indian corn. When Columbus visited this country he found the natives smoking the former rolled up in leaves of the latter. Four centuries ago tobacco was unknown to the civilized world; to-day it is cultivated in every quarter of the globe, and it is estimated that it is used by nearly nine hundred million of people. Maize, or Indian corn, on the other hand, is little known beyond the shores of its native land. The rapid growth of the tobacco habit, which soon spread to every corner of Europe and even beyond, can be accounted for only upon the supposition that it satisfies a certain craving of the system for a gentle stimulant and mild narcotic. To most people the smell and taste of tobacco is at first repulsive, but the first dislike very frequently changes to an irresistible craving. Fashion has had much to do with the extensive use of tobacco, for the youth who thinks it manly to smoke endures the attendant nausea as bravely as his sister submits to tortures that fashion inflicts on her, or as the savage yields himself to the instrument of tattoo. The habit once acquired, it is as difficult to break it as it is to overcome the love of strong drink, or to curb unbridled passion. *Kleptomania* and *dipsomania* are words coined to express certain forms of mania, to which a third might be added (*capnizomania*) to describe the slave of the pipe. But smoking is not the worst form in which tobacco finds use in this country.

The chemical constituents of the tobacco leaf are numerous and interesting. The quantity of mineral matter, or ash, is very large, amounting in some cases to 27 per cent., of which a considerable portion is potash salts. Hence tobacco is very exhausting to a soil, and the ashes would prove an excellent fertilizer, but unfortunately the manner in which the tobacco is burned precludes the possibility of its being returned to the soil where it grew. The leaf contains albumen, cellulose, gum, and resin; also various organic and inorganic acids, such as ulmic, pictic, oxalic, acetic, citric, nitric, hydrochloric, sulphuric, and phosphoric. Characteristic of this plant and peculiar to it are nicotine, nicotianine, and nicotic acid. Of these nicotine, $C_{10}H_{14}N_2$, is a liquid alkaloid, with the odor of tobacco and an acrid taste. It is a deadly poison, even in small doses. The best Havana tobacco contains less than 2 per cent. of this substance; Virginia has from 6 to 7 per cent., and poorer qualities have even more. Vohl and Eulenberg found only 0.06 per cent. in snuff. The same investigators state that the strongest chewing tobacco was found to contain only a trace of nicotine, and other specimens none at all.[1] They also say that nicotine is not present in the smoke of tobacco. In 1879, Wilkens took a patent[2] in Germany for removing nicotine from tobacco leaves by means of benzine or petroleum ether. Prof. R. von Wagner suggested that the manufacture of cigars free from nicotine by leaving out the tobacco would be more rational. Schlœssing's method has been improved by R. Kissling, who gives the following method of ascertaining the amount of nicotine in leaf or manufactured tobacco: "Twenty grams of tobacco, dried at 60° C. and coarsely powdered, are carefully moistened with 10 cc. of an alcoholic soda solution (6 grm. sodic hydrate in 40 cc. of water and 60 cc. of strong alcohol), then extracted for 2 or 3 hours with 100 cc. of ether in a Tollen's extraction apparatus. The ether is carefully, but not completely, evaporated; 50 cc. of a 0.4 per cent. soda solution added, and the mixture distilled in a current of steam until 400 cc. have come over. Each 100 cc. of distillate is collected separately, and titrated with normal sulphuric acid, using rosolic acid as indicator." Nicotianine, or tobacco camphor, is a fatty substance, obtained by distilling the leaves with water. It forms minute acicular crystals. Barral found a crystallizable acid in tobacco-juice, and gave to it the name of nicotic acid. Other chemists claimed that is was malic acid. Fischer has recently obtained nicotic acid synthetically from pyridine.

The greatest smokers in the world are the Germans, who usually prefer the cigar, although the pipe and cigarette are not far behind in popularity. Smoking there is confined to the men, although the fair sex rarely object to smoke; hence it is not customary to ask their permission before lighting a cigar. On express trains *one* compartment is usually reserved for "non-smokers," and marked accordingly, smoking being permitted everywhere else. Professor Hinds says that during a six months' residence at Berlin he met with but one German who did not smoke. But the German never chews; he is too de ent for that. In England and France the cigar is a necessary accomplishment, and snuff still holds its sway. Russia follows close behind, and the cigarette is quite popular among the ladies there. In the East all smoke, without regard to sex or age, and in Burmah it is said that the children smoke in the mother's arms. In our own country smoking and chewing are mostly confined to the stronger sex, although our good old grandmothers enjoyed the pipe as well as their husbands. The cigarette is now growing in favor with the ladies, but at present it rests under the ban of being considered *fast*. The use of snuff is rapidly dying out except at the South, where "dipping" is much practised by the women, especially those of African descent. Chewing is a common habit among soldiers, sailors, printers, and others, whose occupation interferes with handling a pipe, or where sparks might do injury.

Various substances are used for flavoring cigars and cigarettes, a few of which we give below: —

Cigar Flavors.

(1.)	Fluid extract of valerian	1 fl. oz.
	Tincture of tonka-bean (1—8)	8 " "
	Alcohol, q. s. to make	32 " "
(2.)	Valerianic acid	3 fl. dr.
	Butyric ether	10 mm.
	Acetic ether	40 "
	Alcohol	64 fl oz.

[1] Journal of Chemical Soc., London [2], ix. 1075.

[2] Dingler's Journal, ccxxxii. 486.

(3.) Tincture of valerian	4	fl. dr.
Butyric ether	4	" "
Tincture of vanilla	2	" "
Spirit of nitrous ether	1	" "
Alcohol	5	fl. oz.
Water, q. s. to make	16	" "

Saccharine matters are also used, such as sugar, molasses, and licorice, very large quantities of the last-named article being consumed by tobacco manufacturers.

In regard to the physiological action of tobacco much difference of opinion seems to exist. Most physicians agree that it is seldom beneficial; while the large number of people who seem to suffer no injury from its use prove that it is much less injurious than its opponents would have us believe. There are some persons who cannot use it without injury, and if every one would discontinue its use as soon as he became aware of its doing him harm, little could be said against it on physiological grounds. Unfortunately its victim is rarely able to break the chains that bind him to any injurious habit, and the tobacco habit is no less strong than the opium habit, the chloral habit, or any other habit. It is generally conceded, even in ever-smoking Germany, that it should not be indulged in during the period of growth, and in some places boys are not permitted to smoke under a certain age.

The pleas offered for it by its votaries are as follows: It is fashionable; it is genial company; it soothes the nerves and enables one to do better work; it preserves the teeth; it is an anti-fat; it is a luxury.

The objections to its use, as stated by Professor Hinds in his recent work, entitled "The Use of Tobacco," are the following: —

(1.) While it is a source of great present revenue to the people who cultivate it, it will in the end be detrimental to the country, because it is a crop which is very exhausting to the soil and soon wears out the land. Besides, it is not to the buyer a just equivalent for the money he pays for it.

(2.) The use of tobacco is a habit which continually grows stronger, at the same time weakening the will, and finally making man its abject slave. Such habits are sedulously to be avoided, although they could be shown to have no other ill effects.

(3.) Its associations are very bad. It is the inseparable companion of dram-drinking, gambling, loafing, and sporting. . . .

(4.) As a social habit, it makes one acquainted with strange companions. It also encourages loafing, lounging, and laziness.

(5.) Its physiological effects, unless it is very carefully and moderately used, are such as to warrant its abandonment, even if there were no other considerations.

(6.) All its ill effects are transmitted from parent to child, and usually with a weakened constitution and a disposition to intemperance.

(7.) It is a filthy habit.

(8.) It is an expensive habit.

(9.) It is of doubtful morality, because its consequences are bad. —•— H.

EXPERIMENTS FOR YOUNG CHEMISTS.

BY PROF. E. J. HALLOCK, PH. D.

VIII.

SULPHUR.

Put several pieces of roll sulphur in a test tube, and heat it gently. It will soon melt, and by warming one side of the test tube it can be poured out. Pour a few drops of the melted sulphur into cold water, and then heat the remainder to a higher temperature. It will turn brown, and become so thick that it will not run out on inverting the test tube. On heating it a while longer the sulphur again becomes liquid. Pour some more of it in water. By moving the test tube about a little it can be obtained in long strings, which are soft and plastic, but dark colored. That which was poured in previously is yellow and brittle; each drop forming a little ball. Sulphur melts at 111° C., becomes viscous at 222° C., and boils at 400° C.

Pulverize one gram of sulphur and boil it in milk of lime. Filter the solution, and to the filtrate (that is, the liquid that has run through the filter) add some hydrochloric acid. A white precipitate of very finely divided sulphur is thrown down.

SULPHUR DIOXIDE.

This gas has the formula SO_2, and is sometimes called sulphurous acid. Burn a piece of sulphur in oxygen gas; it burns with a blue flame. Then introduce a lighted candle; the candle will be extinguished. Notice the peculiar penetrating odor. Moisten a strip of blue litmus paper and put it in the vessel where the sulphur was burned; it turns red, because the sulphur dioxide unites with the water to form sulphurous acid, $SO_2 + H_2O = H_2SO_3$. Sulphurous acid exists only in solution, like carbonic acid, H_2CO_3, but it forms a series of salts called *sulphites*.

Fig. 11. Preparation of Sulphur Dioxide.

Put some pieces of metallic copper in a test tube, and cover them with concentrated sulphuric acid. Arrange the tube as shown in Figure 11, so as to collect the gas by downward displacement. Upon applying heat the gas will be given off, and soon becomes perceptible to the sense of smell. When the jar is full of gas, put a lighted taper into it; it is extinguished, as in carbon dioxide. Moisten a red rose and put it in the gas; it will soon become white. Pass some of the gas into water, and it will form a solution of sulphurous acid, that may be preserved for future experiments.

SULPHURIC ACID.

This useful substance, H_2SO_4, cannot be prepared, like the other acids, on a small scale with ease. Some of its properties may be studied. It chars wood and paper by removing the elements of water. When poured into a sugar syrup it blackens it, and the mass of spongy carbon increases remarkably in size. Put one drop of sulphuric acid in a test tube full of distilled water; then add a few drops of hydrochloric acid and of a solution of barium chloride. The latter produces an insoluble white precipitate: $H_2SO_4 + BaCl_2 = BaSO_4 + 2HCl$. This is a very delicate test for sulphuric acid and the sulphates. Pure sulphurous acid does not produce a precipitate with barium chloride solution. Add some of the latter to the freshly prepared solution of sulphurous acid. If a precipitate forms it is due to the presence of sulphuric acid. Filter the solution if it becomes milky, and then pour slowly into it a solution of potassium permanganate. The red color of the latter rapidly vanishes, and a white precipitate of barium sulphate is produced, showing that the sulphurous acid is oxidized into sulphuric acid by means of the permanganate.

$H_2SO_3 + O = H_2SO_4$. Sulphuric acid forms a series of salts called *sulphates*.

SULPHYDRIC ACID.

A convenient form of apparatus for generating this gas, H_2S, is seen in Figure 12.

Fig. 12. Preparation of Sulphydric Acid.

The delivery tube from the generator leads to a test tube half full of water and provided with a double-bored cork. The gas is passed through water to wash it. The generator contains ferrous sulphide, FeS, made by heating sulphur and iron together. Fill the bottle one third full of water, and when it is desired to generate the gas pour some sulphuric or hydrochloric acid down the funnel tube. The gas may be collected over water, in which it is, however, quite soluble, or better by displacement. It has an unpleasant but characteristic odor, and should never be made in a room painted with white lead or containing anything that may be injured by it, as polished metals, etc. It is seventeen times as heavy as hydrogen.

Dissolve in separate test tubes some zinc sulphate (from making hydrogen), copper sulphate (from making sulphur dioxide), some salt of lead, cadmium, mercury, antimony, arsenic, and bismuth. Add to each a drop or two of hydrochloric acid, and then pass sulphydric acid gas into them, as seen in the figure. Zinc will yield no precipitate; cadmium and arsenic yield a yellow precipitate; antimony, red or orange; and the others, brown or black. Make a fresh solution of zinc sulphate, and add ammonia hydrate. At first it gives a white precipitate, but this afterwards dissolves when more ammonia is added. Pass sulphydric acid gas into this alkaline solution; a white precipitate will be the result. Zinc is the only heavy metal that has a white sulphide. Sulphydric acid forms a series of salts which contain no oxygen and are called *sulphides*. Thus we have: —

Sulphuric acid forming	Sulphates.
Sulphurous acid forming	Sulphites.
Sulphydric acid forming	Sulphides.
Hyposulphurous acid forming	Hyposulphites.

—•—

SCIENTIFIC BREVITIES.

Pensions for the Victims of Science. — Professor Dumas, the Perpetual Secretary of the Académie des Sciences, has received instructions from the Minister of the Interior for the preparation of a list of all the *savants* who either have died or have been injured during the execution of experiments, or in making investigations in the interests of science. It is the intention of government to accord

a national pension to the widows and orphans of such *savants* who have died, or to those *savants* who have been injured. The list, it may be foreseen, will be a long one.

A Scientific Smuggler. — The Berlin *Montagsblatt* tells this story: In 1805 Humboldt and Guy Lussac were in Paris, engaged in experiments on the compression of air. The two scientists found themselves in need of a large number of glass tubes. These were exceedingly dear in France at the time, and the rate of import was something alarming. Humboldt sent to Germany for the needed articles, and gave directions that the manufacturer should seal up the tubes at both ends, and put a label upon each tube with the words *Deutsche Luft* ("German air"). The air of Germany was an article upon which there was no duty, and the tubes were passed by the custom officers without any demand, and arrived free of duty in the hands of the two experimenters.

Depths of the Pacific Ocean. — Captain Belknap, commanding the United States steamer *Alaska*, reports from Callao the details of soundings in a run of 112 miles off shore. At a distance of 102 miles he found a depth of 3368 fathoms, or nearly four statute miles, the deepest water yet found in the South Pacific, or in the eastern margins of both the North and South Pacific. He stood ten miles further to the eastward, but found only 3168 fathoms. In both casts the cylinder brought up clay and greenish sand, and the bottom temperature of the deepest was 34.2 degrees Fahrenheit.

The Weight of Air. — We all know that air has weight, but we are apt to have rather vague ideas as to the weight of comparatively limited quantities of it. A cubic foot of air weighs 538.1 grains, or something over 1 ounce; 13.06 cubic ft. weigh one pound. About 65 cubic ft. of air furnish 1 pound of oxygen. An apartment 8 ft. high, 12 ft. wide, and 13 ft. long contains about 100 pounds of air; and a room 40 ft. square and 18 ft. high contains about a ton.

The Sizes of Famous Heads. — In *Nature*, Mr. Tuckett gives the following as the sizes of hats worn by certain distinguished men: Lord Chelmsford, 6½ full; Dean Stanley, 6¾; Lord Beaconsfield 7; the Prince of Wales, 7 full; Charles Dickens, 7⅛; Lord Selborne, 7⅛; John Bright, 7⅛; Earl Russell, 7¼; Lord Macaulay, 7⅜; Mr. Gladstone, 7⅜; Mr. Thackeray, 7⅝; Louis Philippe, 7¾; M. Julien, 7¾; Archbishop of York, 8 full.

Boring the Ears. — The London *Lancet*, referring to this subject, very emphatically scouts the idea that boring the ears can have any effect on sore eyes. It reminds us that the only possible influence this operation could have on the eyes would be in so far as it acted as a counter-irritant, and since the wounds in the ears heal so rapidly this argument amounts to nothing; the same, and even better, results could be derived from blisters behind the ears.

HINTS FOR EXPERIMENTS.

To Show Change in Weight by Oxidation or Reduction. — An English writer suggests the following modification of Max Rosenfeld's experiment, described in the March number of the Journal, page 27: —

The directions for the experiment say: "The foil with its load is carefully removed, and held over a flame until the iron is converted into oxide. When cold, it is replaced on the glass cup, and causes the instrument to sink until the cup almost touches the water." A far more effective way of performing the experiment is to make a little mound on the foil, of iron, carefully reduced from the finely-powdered oxide at the lowest possible temperature, and then to apply for a moment the light of a taper to the extreme top of the mound. The iron will begin to oxidize at the point of application of the flame, and the oxidation will spread through the whole mass of the metal, notwithstanding that the taper has been removed; the hydrometer will sink the while.

To Illustrate the Production of Fogs. — How the solid particles of certain gases floating in the air produce fogs has been illustrated lately by Mr. Newth with lecture-room experiments. A bulbous flask of glass, connected with an air-pump and containing a little water, was placed on the table so that a beam from an electric lamp could illuminate the interior. Some of the mote-filled air of the room was let into the flask, which was partially exhausted of air. Soon the flask appeared to be filled with fog, but on washing out the motes by agitating the water in the flask the fog became far less appreciable. A small quantity of smoke admitted into the flask produced a thick fog; so, also, did the fumes from a piece of burning sulphur, and even a platinum wire, rendered incandescent by an electric current, gave off sufficient solid particles of dust or other matter to produce a fog.

Practical Chemistry and the Arts.

ESTIMATION OF ROSIN IN SOAP.

Up to the present time there has been no accurate method known for determining the amount of rosin in soap, for in chemical properties rosin is almost identical with the fatty acids. In the last number of the *American Chemical Journal*, T. S. Gladding describes a new method, which depends upon the solubility in ether of the silver resinate, and insolubility of the oleate, stearate, etc. One gram of the soap is dissolved in alcohol, and some alcoholic potash added, and heated to ensure complete saponification of any traces of fat present. When cool it is placed in a 100 cc. flask and filled to the mark with ether, and shaken. About 1 gram of neutral silver nitrate is rubbed to a powder, and introduced into the flask, which is vigorously shaken for 10 or 15 minutes, when it will settle clear. A portion of the supernatant liquid is siphoned off, filtered if necessary, and more silver added. If no precipitate is produced, 20 cc. of dilute hydrochloric acid (1 of acid and 2 of water) is added, to precipitate the excess of silver. After shaking vigorously, the precipitate is allowed to settle, and an aliquot portion of the supernatant ether solution is siphoned off into a weighed dish, and carefully evaporated to dryness. The residue is rosin, containing a small amount of oleic acid. This involves a slight correction, found to be 2.35 mg. for every 10 cc. of liquid shaken up with hydrochloric acid.

LEAD IN TINNED WARE.

Several of our exchanges have been publishing the following test for lead in tin: —

"A small bit of the tin is detached and put into a watch glass, with a drop of nitric acid and two or three drops of water; the glass is then gently heated over a flame, and when the solution is complete a few drops of water and a concentrated solution of iodide of potassium are added, when, if lead is present, a yellow precipitate will be the result."

The editor who started the joke evidently forgot that tin does not dissolve in nitric acid, so that, in case the watch glass did not break, the experimenter would wait in vain for "complete solution." In the second place, nitric acid liberates iodine from the solution of iodide of potassium, rendering it difficult to decide whether a precipitate is formed or not. Bichromate of potash is equally unsatisfactory. Even sulphydric acid gives no precipitate in a solution of lead, if nitric acid is present in excess.

INDUSTRIAL MEMORANDA.

Asbestos Paint. — Some interesting tests have recently been made in England of the value of asbestos paint applied to wood, canvas, and other combustible materials. Amongst other experiments a piece of light pine wood, about six inches long by four inches square, painted with five coats, was placed for upwards of half an hour in an ordinary grate fire, but, although the wood within was reduced to charcoal, there was no blaze whatever emitted during the charring. A small model theatre, built of wood, with set scenes and accessories, was sprinkled with turpentine and set on fire. Every portion ignited and the whole was consumed. A similar model, with the set scenes and the wood-framing all painted with asbestos, was drenched with turpentine and set fire to, but the thin scenes were only partially charred at the lower ends with the turpentine flames, whilst the timbering was not even ignited. Similar illustrations were made with two models of larger size, about four feet cube, built on a bed-plate of one-inch deal board, and set fire to by a bundle of shavings. The one was burned and the bed-plate set on fire. In the other case, where the framing, scenes, and bed-plate had been painted with asbestos, no ignition was effected, and, although the lower portions of the light scenes were destroyed by the fierce flames of the shavings, the rest remained intact.

Double-Glazing. — A writer in the *English Mechanic* points out some of the advantages of double-glazing in promoting the health of homes in winter. Skylights, he says, ought never to be put up unless double or double-glazed. Double-glazing answers perfectly if the sashes are grooved out for glass on each side, and are then glazed, with an air-space of one half inch or more between the panes of glass. The glass must be put in with its inner faces perfectly bright and clean, and the glazing should be done on a cold, dry day, so as not to include watery vapor, which in cold weather will condense inside the air-space, and cause mistiness. This double-glazing, with an air-space, makes a window almost as warm as a brick wall, and not only keeps up the temperature of a room in winter, and saves fuel, but it keeps the room cool in hot weather, and it makes the temperature more uniform throughout the apartment. With ordinary thin glazing in winter, the inmates are always being chilled on that side which looks toward the window, and baked on that side which is toward the fire. Double-glazing our window-sashes would save all this trouble.

Oxygen. — The manufacture of oxygen is being conducted on a large scale, says *Nature*, at Passy, France. The method employed consists in passing air over caustic baryta, whereby it is converted into a peroxide. By increasing the heat the latter is decomposed and the excess of oxygen liberated. Brin Freres have made some improvements in the preparation of the baryta, which promise to render this method of making oxygen more economical than hitherto. The baryta is heated in metallic retorts, connected in groups of fifteen, in two furnaces heated by gaseous fuel. The cost of oxygen made on a large scale is estimated at 0.12 to 0.15 francs per cubic meter, or about 6¾ to 7 cents per 100 cubic feet, counting fuel at the price in France. The baryta is worth about $23 per hundredweight.

Chewing-Gum. — According to an exchange, forty thousand dollars' worth of chewing-gum is gathered in the State of Maine every year. In Ox-

ford County is a man who makes it his business to collect spruce gum. Every year he buys from seven to nine tons. The gum is found chiefly in the region about Umbagog Lake and about the Rangely lakes. A number of men do nothing else in the winter season than collect gum. With snow-shoes, axe, and a toboggan, on which the gum is packed, they spend days and nights in the woods. The clear, pure lumps of gum are sold in their native state, the best bringing one dollar per pound. Gum not immediately merchantable is refined by a peculiar process. Sieve-like boxes are covered with spruce boughs, on which is placed the gum. Steam is introduced underneath. The gum is melted, is strained by the boughs, and then passes into warm water, where it is kept from hardening, until the packer takes it out, draws it into sticks, and wraps it in tissue-paper, when it is ready for market.

The gum meets with a ready sale. There is not a village, town, or city in Maine where it is not in demand. One dealer last year sold fourteen hundred dollars' worth. In the large mill cities, gum has a free sale.

Preserving Meat. — A method of preserving meat by causing the heart of the animal to pump boracic acid into the tissues has been recently patented. A sheep, for instance, is stunned by a blow, and blood being withdrawn from the left jugular vein, a strong solution of boracic acid, kept at blood heat, is injected. In a few minutes the heart of the still living animal has pumped the antiseptic fluid into all parts of the body, and the sheep is then killed in the ordinary way by the butcher. The cost is said to be less than 6 *d.* per sheep, and the meat will keep for five or six weeks in summer.

ELECTRIC SPARKS.

Rapid Telegraphing. — In a recent trial of speed the Rapid Telegraph Company succeeded in sending over a single wire from New York to Boston fifteen hundred words in one minute.

Telephone Wires. — There are 9000 miles of telegraph and telephone lines in the streets and on the house-tops of New York city; 3500 of these belong to the Metropolitan Telephone Company.

Storage Battery. — Mr. Sutton, of Ballarat, has improved his electric storage battery by a newly constructed cell, which he describes as a flat copper case, shaped as a Grove cell. From its lid of paraffined wood hangs a plate of mercury-amalgamated lead. The liquid with which it is charged is a solution of cupric sulphate, containing one twelfth of hydric sulphate. "The presence of this free sulphuric acid," writes Mr. Sutton, "improves the cell at once."

Colored Copper Depositing. — Mr. Weil has succeeded in depositing a layer of suboxides of copper on any metals or alloys with the same copper bath, an adherent and lustrous layer being obtained. These multi-colored metallic deposits are obtained at will, either united or changeable, according to the manner in which the objects are exposed to the action of the current. The different colors, which are of great solidity, are due to the presence of suboxides of copper, and not to an effect of thin crusts.

A New Use for Electricity. — A recent number of the *Comptes Rendus* tells how M. Grandt has constructed an apparatus for giving movement to ships. An ordinary steam-engine will set in motion several electro-dynamic induction machines. The current is transmitted to a voltameter containing acidulated water, which is decomposed into oxygen and hydrogen. These two gases are conducted into a tube, and escape by an aperture near the keel. A little above this aperture are two platinum points, isolated from each other and in communication with an induction coil. When the gas escapes a spark explodes it, and this explosion moves the ship.

Underground Wires. — The subterranean telegraph system, connecting 221 towns and cities of Germany, is now complete. This leads us to hope that we shall at some future time be rid of unsightly telegraph poles in our streets and networks of wires covering our cities.

The Wire Path for Lightning. — A further illustration of the danger connected with the electric-light wires occurred during the first thunder-storm of this year in the Northern States (February 21st). The tunnel being excavated in rock for the New York, Ontario, and Western Railroad, above Hoboken, N. J., is lighted by electric lamps, and when the blasts are to be discharged the lamp wires are used, the lamps being disconnected. While in this condition, on the date named, a flash of lightning passing through the wires exploded the blasting charge. Fortunately the kind of rock and the positions of the men were such that no lives were lost.

Electromotive Force in the Telephone. — Pellat has been experimenting on the strength of current necessary to produce a sound with the telephone, and finds that it is less than 0.0005 of a Volt. By converting this into units of heat it will be seen that the cooling of one gram of water one degree Centigrade would develop enough energy to produce in a telephone a sound that would continue to be heard for ten thousand years.

Telephone Progress in Switzerland. — A recent report by the Telephone Company of Zurich shows that in that city there are eleven places into which the public may enter, and, for a small payment, converse for a quarter of an hour with any of the subscribers, who are 378 in number, connected with two central stations. Four of these telephone-chambers are in tobacco-shops, two in post-offices, and the rest in sundry shops. Among various other institutions adopted by this enlightened town is the connection of the telephonic system with the central telegraph system. Thus, any subscriber can dictate his telegram to the telegraph employee, and so gain the time which his domestic would otherwise take to convey it to the office. The state realizes an economy on the carriage of telegrams addressed to the subscribers. During 1881 there were 8914 telegrams transmitted by telephone.

Telegraph Mileage of the World. — A French statistician has calculated that if all the telegraph wires at present laid were tacked on end to end they would reach 46 times round the world. Belgium has a greater telegraph mileage in proportion to its superficial area than any country in Europe. Switzerland comes second, and Great Britain third. Russia has the least.

PRACTICAL RECIPES.

Elastic Water-Proof Lacquer. — A patent has been taken out in Germany, says the *Metal Worker*, for an elastic lacquer which will not peel off. It is intended for wood and iron work, as well as carriage-cloths and other articles that are to be rolled or folded. To produce this lacquer 50 lbs. of linseed-oil varnish are heated up to the boiling point. In another vessel about 15 lbs. of lime are slaked in 20 lbs. of water. As soon as the lime boils, about 50 lbs. of hot melted raw caoutchouc are added to the lime-water, and the whole is then stirred until thoroughly mixed. This mixture is now stirred into the boiling varnish, and afterwards strained or filtered and left to cool. It may be applied hot, or mixed with more varnish and used cold.

Glycerine Leather Polish. — To make glycerine leather polish, mix intimately together three or four pounds lamp-black and one half pound of burned bones with five pounds glycerine, and five pounds syrup. Then gently warm two and three fourth ounces of gutta percha in an iron or copper kettle until it flows easily; then add ten ounces of olive oil, and, when completely dissolved, one ounce of stearine. This solution, while still warm, is poured into the former and well mixed. Then add five ounces gum senegal dissolved in one and one half pounds water, and one half ounce of lavender or other oil to flavor it. For use it is diluted with three or four parts of water. It is said to give a fine polish, is free from acid, and the glycerine keeps the leather soft and pliable.

Cleaning Sponges. — Charles Roberts, F. R. C. S., in the *British Medical Journal*, writes on the means adopted to clean sponges from the organic and earthy materials taken up by the sponge from hard water. Preparations of chlorine, soda, and sulphurous acid, he says, injure the texture of the sponge. Condy's fluid stains, and carbolic acid consolidates organic matters in the meshes of the structure. He finds that returning the sponge to its native element, or, what answers equally well, steeping it in strong salt and water, to which a few grains of iodine have been added, enables it to throw off its impurities and to regain its normal elasticity and absorbent properties, and at the same time to become completely disinfected. The process is not a rapid one, and iodine is only slightly soluble in salt water; so that very dirty sponges cannot be purified in this way, and a preliminary washing in soap and warm water may be necessary. Sponges may be kept in this kind of pickle for any length of time without injury to their texture. A bath-sponge which has been treated in this way has the pleasant seaside smell which has been attributed to the presence of ozone, but is more probably due to iodine.

Non-Inflammable Materials. — For diminishing the danger of conflagration in theatres, Signor Giovanni Abelo Martini recommends the following formulæ for rendering materials non-inflammable in the three different cases below: —

(1.) Mixture suitable for light tissues: —

	Parts.
Pure sulphate of ammonia	8
Pure carbonate of ammonia	2½
Boracic acid	3
Starch, dextrine, or gelatine	2
Water	100

(2.) Mixture suitable for scenes already painted, timber-work, furniture, doors, and windows, to be applied like paint with a brush, at a temperature of about 140° F.: —

	Parts.
Hydrochlorate of ammonia	15
Boracic acid	5
Glue	50
Gelatine	1
Water	100

(3.) Mixture suitable for cloths, ropes, and straw, which should be immersed for 15 or 20 minutes, at a temperature of 212° F., and allowed to dry: —

	Parts.
Hydrochlorate of ammonia	15
Boracic acid	6
Borax	3
Water	100

Paint for Brick Walls. — A cheap paint is made for brick walls by simply mixing up good hydraulic cement in water. The natural tint is neutral and pleasing, but may be readily varied. This paint cannot be washed off by storms, nor peeled off by the sun.

Grease Eradicator. — The following is commended: —

Castile soap in shavings	4 oz.
Carbonate of soda	2 oz.
Borax	1 oz.
Aqua ammonia	7 oz.
Alcohol	3 oz.
Sulphuric ether	2 oz.

Soft water enough to make one gallon. Boil the soap in the water until it is dissolved, and then add the other ingredients. Although it is not apparent what good two ounces of ether can do in a gallon of liquid, the mixture is said to be very efficient.

Agriculture.

ENSILAGE.

THE ensilage fever is now in its intensest stage of heat, and therefore the time is not the most favorable for the presentation of a careful, accurate consideration of the true claims of the new form of fodder. The old fallacy which possessed the minds of farmers at the time of the introduction of silos still clings to many of those who have constructed them on their farms, that, somehow, in some way, a great increase of nutriment in corn fodder is secured by ensilaging it. In other words, they believe that one hundred pounds or one ton of good ensilaged corn fodder contains much more nutriment than the same weight of green stalks, or its equivalent in the air-dried condition of the fodder. In all our experiments in the laboratory and observations in practical trials in the barn, the conclusion has been reached that the true value of silos does not consist in any important increase of nutriment in fodder, but in the saving of expense in storing and feeding it. If there is no saving in this direction; if it costs as much in time and labor to ensilage corn stalks as it does to cut and dry them in the field, and when in the barn to cut and crush them so that animals will eat them readily, then there is no advantage in ensilage.

It is a surprising fact that many, if not most, farmers believe that *something* valuable is lost in drying fodder; they believe that important constituents or rich plant-food goes off with the water. This is an error. All the moisture in corn stalks does not go off in field drying, and the air-dried plants which hold thirty or thirty-five per cent. of the original water in the green state will keep well when stored for winter use. In drying grass or corn fodder the water is by far the most volatile constituent, and as the solid material, or nutrient portions, is held only in *suspension* in the watery juices, the water evaporates, leaving behind the heavier and more valuable particles. The disadvantage which exists when ensilaged fodder corn is contrasted with the dry fodder is only apparent, not real. Animals will eat, digest, and assimilate; and cows will give as much milk, and oxen and horses will do as much work, when dried corn fodder is fed to them as when fed with the same ensilaged. If the dried corn fodder is cut and crushed and moistened with a little warm water, animals will eat it up clean with as great relish as they apparently do ensilage. There is no advantage in ensilaging corn or other kinds of fodder unless it be in a saving of expense, in time and labor, and in convenience of feeding.

The conclusions which we have reached from a careful consideration of this subject are supported by recent experiments at the New Jersey Experiment Station, conducted under the supervision of Professor Cook. His results are of great interest to farmers, and corroborate the views upon ensilage so often expressed in the JOURNAL and elsewhere. Professor Cook's experiments extend over a period of nearly six months, and were made with green fodder corn, air-dried corn, and ensilaged corn. The experiments were conducted in the barn in feeding cows with the different forms of fodder, and in the laboratory in testing results, and they are in the highest degree trustworthy. He sums up the results as follows: —

First. When the green corn was dried in stacks in the field the loss *was less* than it was when the corn was packed in a silo.

Second. When dried corn fodder was cut and crushed, it was eaten by cows quite as readily and with as little waste as ensilage.

Third. In three cases the yield of milk was not increased when ensilage was substituted for dried corn.

Fourth. In the mixed milk for twenty days of one herd of cows, ensilage caused no increase in the yield of total solid matter in the milk, while in another herd it caused a gain of only seven per cent.

The opinions of those who have been using ensilage in their farm barns during the past winter are as a whole favorable to the new form of fodder. We have taken considerable pains to investigate the nature of the contents of silos and the effects upon stock of the food drawn from them, and are prepared to say that all questions regarding their safety and high profit are not conclusively settled.

In all silos that have come under our observation during the winter and spring, the food has been found to contain more than a trace of acetic acid, the result of protracted fermentation. In one case of a large silo, the acid was present in the proportion of 0.03 per cent., an amount which "set the teeth on edge," when the fodder was masticated. This acid, so far as could be observed, did not make the food any less agreeable to the stock to which it was fed, but of its ultimate hurtful influence there can be but little doubt. It must, in time, disturb digestion, impair the powers of assimilation, and cause flatulency and colic. Vinegar is not a natural condiment in the food of any animal, and to milch cows it would seem to be particularly objectionable. Its effects may not be seen in one season, or perhaps two, but the ultimate results cannot be salutary. It is perhaps possible to obviate this objection, but in a dozen or more silos examined it was found to exist. Few farmers have as yet been able to show exactly what the cost of the ensilage is in comparison with dry fodder, but the facts will come out sooner or later.

It is probable that the whole matter of ensilaging crops will undergo a complete revolution in a few years. The present expensive silos may be found not so well adapted to the purpose as others of cheaper construction. It is not probable that ensilaging will fall into disuse, but that better methods and cheaper structures will supplant those now in use.

A NOVEL EXPERIMENT IN AGRICULTURAL EDUCATION.

THE *Irish Farmers' Gazette* gives an account of a "travelling educational dairy," which is both interesting and suggestive. We take the following paragraphs from the article, which is too long to be quoted in full: —

The staff consisted of a lecturer, dairyman, and woman. The former was an Englishman, son of an extensive milk and butter merchant in London, with a long experience in butter making, packing, and selling. His story was well arranged and well told. The dairyman and woman were pure Hibernians, and just the very people for the work, — neatness, order, cleanliness, and methodical working personified. John, in his neat, white jacket, and Ellen, in her dainty holland dress, were fit to compare with the best of the best of their class, — Saxon, or Norman, or Dane. The dairy was fitted with the Holstein churn and butter worker, and other appliances which the great dairy shows have made celebrated, the object of the dairy being to show the method of butter-making adopted by the best Continental producers of that article. Cream only was churned, and the subject-matter of the lectures is conveyed briefly in the articles lately published on the subject by Canon Bagot.

Thus equipped, the Educational Dairy commenced its tour by a journey to Dunsany Park, in Meath. This is not much of a dairy country, and the population is very scattered. Audiences, therefore, were small, but the lectures and working were much appreciated. The next trip of the dairy was to the Birmingham Dairy Show. Each day some 16 gallons of cream was churned into delicious butter, and sold at 2*s.* (48 cents) per lb. On the last day the demand so far exceeded the supply that the butter was made up in quarter-pound lots, no one being allowed to have more than a single pat. What with the rich brogue of John, the dairyman, the bright face of his wife, the deft handling of pretty Maggie Doyle, who had come all the way from Kerry to help, and the beautiful butter, the people were captivated by this Irish invasion.

The writer goes on to tell how the peripatetic dairy journeyed through Ireland for many weeks, often gathering assemblies of more than a thousand persons to see its performances. At many places a whole week was spent, and people came from considerable distances to listen to the lectures. The closing paragraph of the article is as follows: —

The plan adopted for working the dairy was to show the whole process of butter-making, from the cream to the package ready for sale. While the work was going on the lecturer explained each stage, and gave proper reasons for the adoption of the reforms he had to recommend. As a rule, there were two churnings a day, at each of which about 12 or 16 lb. of butter were made, rolled, and packed in small baskets or boxes, and sold on the spot. Cleanliness and system were the foundation on which his story was built. After the lecture conversations and questions were invited about any part of the address or working not understood by the auditory. Very interesting were these conversations, and most curious were some of the questions. Suffice it to say, in conclusion, that the information collected made it apparent that this institution was very much needed in order to carry proper teaching into many dark places in the country. It was pleasing to find that it was appreciated, and that a really intelligent interest was taken in both lectures and working.

BARN-FLOOR LECTURE.

THE demand for this lecture upon *fertilizers*, how to make them and how to use them, which we gave upon the floor of our farm barn three years ago, has been so pressing that the publishers have issued another edition, which is the fourth in the series.

The demand for the pamphlet is large all over the country, and its popularity has constantly increased. The price is ten cents, which may be sent to the publishers of the JOURNAL, and a copy will be forwarded at once. Five copies will be given as a gratuity to any one who will procure a new subscriber to the JOURNAL. The publishers are C. W. More and Sons, Haverhill, Mass.

IT is now a well-established fact that when the sap and albuminous matters contained in wood are removed the wood will be preserved against warping and decay.

ABOUT TREES.

The Cedars of Lebanon. — The cedars of ebanon have of late years suffered much from the estructive tendencies of visitors. The governor-eneral of the Lebanon has therefore laid down cer-ain regulations for the protection of the cedar-grove Bechérré, and appointed a custodian to see that ie rules are enforced. A wall has been built round the cedar-grove, and, although the cedars ill be accessible to all travellers wishing to visit iem, the erection of tents and establishment of en-ampments will not be permitted within this en-osure, except in such places as may be pointed out y the guard. No fires may be lighted in the vicin-y of the trees, and all cooking operations must be arried on outside the enclosure. The observance this precaution is all the more necessary, as three the largest cedars were recently destroyed by fire, hrough the carelessness of servants attached to the ites of travellers. It is absolutely prohibited to ut branches or sprigs, either for local use or for arrying away. The horses and mules of travellers ill not be allowed to remain within the enclosure; hile other animals, such as oxen, cows, goats, heep, etc., are not to enter under any pretext, and ill be impounded if found trespassing. The in-erpreters and muleteers of travellers will be held esponsible for the infraction of any of these rules, hich the natives also are expected to observe. By hese judicious steps it is hoped that the famous edars will be preserved from destruction.

New Pine Forests. — The recent exploration arty of Colonel Mercer up the Spanish River, in he Province of Ontario, is said to have discovered ast pine forests containing upwards of 24,000,000,-00 of feet of a superior quality of pine timber, with acilities for getting it to the market equal to the est.

Remarkable Tree Growth. — A Madras pa-er, referring to the gardens of the Agri-Horticult-ral Society in that city, says: "The rain-tree *Pitheco obium saman*) in the gardens, the measure-nents of which were given in the proceedings of 7th f August, 1878, and then believed to be under six ears from the seed, continues, in spite of its having een necessary to amputate some of the largest imbs, to grow enormously. Measured on the 30th f July last it gave in girth 9 feet 4 inches at the round, 6 feet 3 inches at three feet high, and 5 feet inches at five feet high; in spread about 85 feet from orth to south, and a total height of about 46 feet. reference to the former measurements shows that he girth at three feet from the ground has increased the last three years 2 feet 2 inches. The age of he tree is, if anything, overestimated; but search being made for traces of the receipt of the seed, hich, it is believed, came from Ceylon about 1872. casuarina-tree standing alongside, which was the pecimen of its order when that part of the ground as laid out at the Botanical Garden, and is there-re known to be about ten years old, now measures five feet from the ground only 2 feet 8½ inches, hough it is about 82 feet high."

DAIRY NOTES.

Feeding Cows on Glucose Meal. — The ref-e of glucose or grape-sugar manufacture, properly ade, if fed fresh, is found to do no harm, and to quite a valuable food; but if allowed to get sour, when acids are used in the first stages of manu-acture, it is very injurious to the milk of the cows d with it. The *New York Tribune* says: An un-ual prevalence of cholera infantum, in one western y of the State, has been traced to active acid in e milk of cows fed on the sugar-meal; and certain ners of cheese factories are said to be so well satisfied that heavy losses of the year on bad cheeses are due to sugar-meal fed to cows that they decline to receive any more milk from dairies where such feed is used. There is but one safe rule in feeding any wet or slippery manufacturing residues: they cannot be used without risk after they have begun to suffer change by open-air fermentation.

Milk as a Carrier of Disease. — Milk is unquestionably a carrier of infection. A dairyman in Halifax had scarlet fever in his family, and subsequent cases of scarlet fever in the locality were confined to his customers, to whom he continued to dispense milk. Milk from cows known to have been afflicted with the preliminary stages of "Texas fever" is said to have caused typhoid fever in persons who have used it. These incidents point to a danger the existence of which has been frequently demonstrated in England. A memorial by the medical officers of health of England has been presented to the local government board, praying that milk dealers be compelled to report all cases of infectious diseases which may appear on their premises, and that local authorities close such premises until the infected animals are removed.

Cheese from Potatoes. — A German paper says that cheese is made in Thuringia and Saxony from the pulp of boiled potatoes mixed with sour milk. These cheeses have this advantage over other kinds, that they do not engender worms, and keep fresh for a number of years, provided they are placed in a dry situation, and in well-closed vessels.

GLEANINGS.

Grafting the Vine on the Cactus. — A San Francisco paper says that a discovery has been made which is likely to revolutionize viticulture in Southern California. It has been found that grape cuttings, inserted in the trunk of the cacti on the desert, grow and thrive as vigorously as in cultivated land. This fact is of great importance to the people. By the use of a chisel a man can plant a large vineyard in a day, and the vines so planted will climb the cactus and grow luxuriantly without cultivation or irrigation. The dry, hot sands of the deserts will afford a fine place for drying raisins. In addition to grapes, it has been proved that melons, cucumbers, and tomatoes will grow from the cactus stock, so that practically the desert may soon bloom as the rose.

Manurial Experiments on Fruit Trees. — If liquid manures are too much diluted the trees are injured, says *Biedermann's Centralblatt*, by being compelled, in seeking nourishment, to take up more water than they need. On the other hand, too concentrated solutions occasion a decay of the roots.

Changes in Barn-Yard Manure on Keeping. — Professor Birner says that the loss of nitrogen in manure on long keeping is considerable, but almost disappears if the manure is protected against moisture. On the addition of one per cent. of kainite and one per cent. of magnesium sulphate, the nitrogen is increased by absorption from the atmosphere.

Reverted or Returned Phosphoric Acid. — Prof. M. Maercker states that returned phosphate of lime appears to have the same value as a fertilizer that an equal quantity of soluble phosphoric acid has. Root crops form an exception, as in them soluble phosphoric acid gives a somewhat better return. In light soils the returned phosphate was found much superior to the soluble.

Temperature of the Soil Underneath Snow. — Contrary to the common opinion, say E. and H. Becquerel, a thick covering of snow does not protect the subjacent soil from severe frost as effectually as does turf.

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, MAY 1, 1882.

FOODS AS CURATIVE AGENTS.

It is a cheering sign of progress when medical gentlemen turn their investigations and discussions in the direction of food nutrition for the sick, rather than towards drugs and vaunted cure-alls. At the present time much attention is devoted to the subject of foods and their influence upon disease, either as curative agents or promotive or morbid conditions. The questions under consideration are, What kinds of food and what quantities are best adapted to the uses of invalids under the different modifications in which diseases exist? Chemistry has informed us as regards the nutritive value of foods, and their probable influence upon the system in health, and also it has thrown much light upon the problem of their influence in morbid states; but we are still in the dark as regards how much or how little nutrition is best for the enfeebled system of invalids. It was formerly supposed that it was best to withhold nutriment in fevers and all inflammatory or zymotic diseases; but now the plan of treatment is changed, and the sufferer is sustained by liquid foods, as milk and broths; so that recovery is more rapid and certain, and the waste in tissues is checked. All wasting diseases are retarded by supplying food in concentrated forms, such as can be easily and fully digested and assimilated by the feeble organs. Consumptives are supplied with meat extracts, which contain nitrogenous constituents, so that nerves and tissues are fed and sustained under the influence of destructive metamorphosis. This would seem to be reasonable and necessary treatment, and the wonder is that it was not adopted earlier in the history of medicine.

In the treatment of chronic ailments many physicians discard medicines entirely, and depend upon modifications in the forms and quantities of foods as restorative means. This course would seem to be safe and commendable, but great good judgment and wise discrimination are required in this method of treatment. The question when to withhold food and when to supply it is one of no small magnitude, as a patient may be greatly injured by errors of judgment in this regard. If there were no such agents known as those described in our pharmacopœia, educated discriminating physicians would be needed to attend upon the sick, and one of the most important duties which would devolve upon them would be to watch carefully the nature and supply of foods administered to their patients. There is a form of treatment which goes by the name of the "starvation treatment," and this means that to some patients all forms of food must be withheld for long periods of time. The opposite of this is the "stuffing" treatment, in which the patient is fed against his appetite; is forced to take food when nature resolutely rebels against its employment. The extreme views of many physicians are to be deplored, as they may lead to great evils. In order to decide how properly to prescribe foods for the sick, a great many circumstances must be taken into account,

and the history and characteristics of patients must be well understood. All "hobbies" in food nutrition must be given a wide berth, or at least they must be carefully considered before adoption. We have great faith in a wise use of food substances as curative agents for the sick, and the subject needs extended and careful research.

WINTER HEALTH RESORTS.

It is very desirable that some point should be found in the Middle States which has a mild, dry climate, suited to the comfort and welfare of a class of invalids who cannot well withstand the rigors of Northern winters. It may well be doubted if such a point exists anywhere north of the Gulf States, and they are too far away to meet the necessities of most invalids. If we only had a chain of mountains somewhere on the coasts of New Jersey or Maryland, corresponding with the maritime Alps which shield Nice, Mentone, Monaco, etc., in the South of France, from the fierce northern winds of winter, it would indeed be a great blessing to thousands. There are several points to which weakly people and semi-invalids resort in the winter and spring months, but they are open to grave objections. Old Point Comfort, in Virginia, has a huge, noisy "watering-place" hotel, which the proprietors have opened for winter visitors, and it has been "crowded" the past two or three winters. It is hardly necessary to define what "crowded" means when applied to a big American hotel. It means noise, jostling, discomfort, poor fare, neglect, and indeed much more. For strong men and women who like hurly-burly, fashion, etc., this may be a congenial point to idle away the winter; but for invalids it is promotive of evils and discomforts hard to bear. The climate at Old Point Comfort is bearable, — that is, it is tolerably mild, and free from severe frosts, — but it is far from being what is desired.

Atlantic City, a point on the New Jersey coast, has recently come into notice as a winter resort for invalids; but it is rather a resort for wealthy families in Philadelphia and New York who wish to repair their wasted energies, wasted in the social follies of the cities. There are at Atlantic City some thirty or more large hotels, many of which have been open for visitors the past winter. They are warmed and made very pleasant inside, and the comforts are not a few. The best of these hotels are "crowded," so that in order to obtain comfortable rooms they must be engaged a week or more in advance. The New Jersey coast is a flat, open one, and has no protection whatever; still, we found the air very bland in March, and the cold much less than in Massachusetts. If some enterprising individual or some company would build a half dozen hotels in that locality, having all the provisions for quiet and comfort which weakly people need, a fortune could be realized speedily. The need of agreeable winter resorts is so urgent that we hope some enterprising persons will take the matter of thorough investigation in hand, and seek out the best place, and supply comfortable homes for invalids in winter.

Bricks or Candy? — A man in the suburbs of a Kentucky town has found a bed of remarkably fine clay on his property, but he is undecided whether to start a brick yard or a French candy factory.

STORING ELECTRICAL ENERGY.

Certainly, one of the most interesting and important results of research in the field of electrical force is the discovery of a method by which it can be accumulated and used when wanted for any purpose. We have often spoken of this discovery in the Journal, and have endeavored to explain briefly the nature of the device employed. There is, however, a very imperfect understanding of what is meant by storing electricity and how it is accomplished, not only among general readers, but among students in science.

There is, indeed, correctly speaking, no such thing as stored *electricity* or stored *force*. It is *energy* which is accumulated in M. Faure's batteries or leaden cells, and this must be distinguished from electricity in itself considered, and also from what is known as force. The earliest form of an accumulator of electrical energy was simply a voltameter worked *backwards*. Sir William Grove increased the efficiency of this device by coating the plates of the secondary battery with platinum black, but still this gave it but little practical utility. Planté's method of using lead cells was an improvement, but did not give the invention commercial value. In 1880 M. Faure conceived the happy idea of putting a thick layer of red lead on the plates, wrapping them in flannel jackets, placing them side by side in a box, and connecting them together alternately, so as practically to produce two plates very near together, with very large surfaces. This is the celebrated Faure accumulator, and promises to do for electric lighting what the gasometer has done for gas lighting. To form the lead plates reverse currents of electricity are sent through them from a dynamo machine, or from any source of electrical force; and this current must be continued for several hours, before the work is done. As the current traverses the surfaces of the plates the red lead is reduced to a spongy material, which is probably lead very slightly oxidized; on the other side it is reduced to lead peroxide. On using the cells to produce external useful currents, the pure spongy lead becomes again slightly more oxidized, and the peroxide slightly less oxidized. In fact, there is a small quantity of oxygen which travels backwards and forwards as the cells are charged and discharged. Now this accumulator does not store electricity, for when charging it just as much electricity passes out as passes in, and when discharging it just as much electricity passes in as passes out. It is a method by which electrical equilibrium is disturbed, passive forms being substituted by active available forms.

In order that this stored electrical energy may subserve useful ends, a very large amount of lead surface must be employed in the cells. A ton of lead in sheets coated with red lead will store enough energy to run several of the large arc lights of the Brush system for a night, and develop mechanical force sufficient to run a five-horse-power engine for a considerable time.

SEWER-GAS.

This term has been used to designate the gas formed by the decomposition of animal and vegetable matter, whether in the sewer, cesspool, or sink. According to the analysis of Dr. Letheby, of London, it consists of sulphuretted hydrogen, sulphide of ammonium, carburetted hydrogen, oxygen, nitrogen, and carbonic acid gas, and organic matter. Fortunately, the first-named constituent is usually present in sufficient quantity to make its presence manifest by its odor, and sometimes it is able to blacken paper that has been impregnated with nitrate of lead. This test-paper is not, however, a safe test for sewer gas, as the more poisonous constituents are without action on lead paper. Sulphuretted hydrogen is stated, in all the text-books, to be exceedingly poisonous. This is no doubt true of the *undiluted* gas, but chemists who are compelled to work in an atmosphere strongly impregnated with sulphuretted hydrogen for a long time suffer no injury from its inhalation mixed with atmospheric air. Bunsen also says that there is no danger from this gas when mixed with air. Then, too, it is very easily decomposed by oxidizing agents like chlorine, or absorbed by metallic salts such as chloride of lead. Its odor is such that none but the most careless will neglect to ventilate a room in which they find any considerable quantity of this gas. Having shown that sulphuretted hydrogen is one of the least dangerous constituents of sewer-gas, we pass by the other gases to speak of the organic matter, that subtle poison which no reagent can detect, no microscope discover. It is now pretty generally known that in the decomposition of animal and vegetable matter, but especially of fæcal matter, the most dangerous products are evolved. Whether these are gases or minute organisms we cannot positively assert, but no doubt remain of their disease-producing power.

Sewer-malaria, as it has been called, does not kill people outright, but it is the source of many diseases which themselves destroy life, and among the acute diseases which it will generate is typho-malarial fever. The congestion of any organ may arise from the breathing of so-called sewer-gas. It robs man of his strength and woman of her beauty; it debilitates the system and hurries its victim into a premature grave.

Mr. George P. Brown, in his little book on "Sewer-Gas and its Dangers," says: "Sewer-gas is no mere bugbear. It is man's mortal enemy." He there gives in detail numerous fatal cases of sewer-gas poisoning in the city of Chicago, the full name and address of the patient being given in each case, with a description of how the sewer-gas found admittance to the house. The list is a very sad one, and a severe commentary on modern civilization.

In addition to the danger incurred from typho-malaria and other diseases engendered by ordinary sewer-gas, there is still another danger not to be forgotten, namely, the means which sewers afford for the spread of contagious diseases. The germs, or poison, of scarlet fever appear time and again where the disease is not expected. Is it not probable that they are carried down the drains of houses to the sewers, in water which has bathed the bodies of the sick or washed their clothes, and are conveyed to a distant part of the city, to be again forced back by the gas which is generated in the sewers into other houses? No doubt many a contagious disease is spread over a city in just that way.

The ordinary disinfectants are of little value against sewer-gas. The only thorough and efficient disinfectant is *fire*. Pass the gases through a flame and they are rendered harmless. Sul-

disinfectants, like chloride of lime and carbolic acid, have so strong an odor of their own that they are able to mask the smell of sewer-gas, and the deluded householder believes he has destroyed the latter gas. Others, which are odorless, like the salts of zinc, iron, and lead, absorb the sulphuretted hydrogen, that most useful indicator of sewer-gas, and render it doubly dangerous. Professor Chandler compares this to pulling down the red flag on a house that contains a case of small-pox. Danger is always increased by removing the danger-signal, and disinfectants too often give a feeling of security which is false. The very bad odor alone of what is called water-gas renders it safe to use it in our dwellings; even the common illuminating-gas would be too dangerous for ordinary use if it had no smell. Coal-gas, the poisonous constituent of which is carbonic oxide, has a very perceptible odor, which often protects us from its evil influence by giving timely warning of its presence.

Disinfection is useful, especially in contagious and other diseases, but it cannot be relied upon to rob sewer-gas of its danger. "The use of these modern abominations, which pretend to kill the germs of disease, patent disinfecting machines, water-closet purifiers, and so forth, is pernicious." Health Commissioner DeWolf says: "Disinfection is necessary at all times, but the disinfectant most easily obtained and applied is fresh air. With this best of all remedial and hygienic agencies, I would keep all houses and rooms constantly supplied. The germs of disease are floated hither and thither, and fed by an impure atmosphere. In pure air they are destroyed, or, at least, lie dormant."

Having briefly sketched the dangers of sewer-gas, and shown that it is useless to fight it with disinfectants, we conclude that our only safety consists in driving it out of our houses and shutting it out. Good drainage, ventilated traps, and efficient water seals are our chief reliance; but, want of space prevents our entering upon the discussion of so extended a theme at this time.

METEOROLOGY FOR MARCH, 1882.

The sum of my observations on the weather for the past month was as follows: —

Average Thermometer.		Lowest.	Highest.	Range.
At 7 A. M.	30.93°	16°	48°	32°
At 2 P. M.	40.10°	27°	56°	29°
At 9 P. M.	33.86°	19°	55°	36°
Whole month	34.90°	16°	56°	40°
Second average[1]	34.42°			
Last 19 Marches	31.314°	22.61° in 1869.	39.18° in 1878.	16.57°
Second Av. do.[1]	31.421°	22.27°	38.84°	16.57°

[1] Found by adding the average evenings *twice*.

The average barometer for the month was 29.991 inches, the lowest 29.45 on the 28th, and the highest 30.48 on the 8th, a range of 1.03 of an inch. The sum of the daily variations was 8.74 inches, an average daily movement of .282 of an inch. The average of the last 10 Marches has been 29.885, the lowest 29.623 in 1881, and the highest 29.991, the present year, a range of .368 of an inch, showing the range of the barometer to be far less in March than in February, where the average range for ten years has been .708 of an inch, or nearly double. The same is indicated by the average daily movements of the barometer, February being .283 and March .260 for the last ten years.

The face of the sky in 93 observations gave 46 fair, 17 cloudy, 18 overcast, 7 rainy, and 5 snowy. One half the month was fair, with only two inches of snow on the 22d. The amount of rain and melted snow was 4.75 inches, while the average for the past 14 Marches has been 5.51; the lowest amount 1.30 in 1874, and the highest 10.22 in 1877. This is the banner month for rain, while September stands at the other extreme.

The direction of the wind, at the three daily observations, gave an excess of 19 northerly and 53 westerly over the southerly and easterly, indicating the prevailing direction to be approximately west 19° 40′ north, or nearly W. N. W. The average direction for the past 13 Marches has been west 32° 15′ north, or nearly N. W. by W. In only one instance (1870) has there been a prevailing easterly direction (an excess of only two observations), and no excess of a southerly. March winds are strongly *northwesterly*.

In general, I may remark that the past March, usually a rough month, has been quite favorable, the temperature being more than three degrees above the average, a high barometer, one half the month fair, little snow, less rain than usual, and no very severe winds; yet with full one half the month cloudy, overcast, or stormy, we have had touches of raw, chilly weather enough to remind us that warlike Mars was on the throne. The spring has thus far opened favorably, and somewhat early, indicating for this region that the winter has done us little damage, with doubtless great good by its rest for recruiting nature and its gentle upheaving frosts, mostly under a warm blanket of snow. The prospect for abundant fruits and a good harvest is encouraging. D. W.

Natick, *April* 5, 1882.

EDITORIAL NOTES.

Massachusetts College of Pharmacy. — The exercises of the fourteenth annual Commencement of this institution were held in the college hall, in this city, on the evening of April 5th. There were twelve graduates, one of whom, in addition to his regular degree, was awarded "honors" for having passed the examination in the elective department of practical and applied chemistry. The exercises on the occasion were creditable alike to instructors and students.

American Newspapers in 1882. — The *American Newspaper Directory*, which will be issued next month by Geo. P. Rowell & Co., of New York, will contain the names of 10,611 periodicals in the United States and Territories, which is a gain of 844 in the year just passed. The number of daily papers has increased in a somewhat larger proportion, and is now represented by a total of 996 against 921 in 1881. The largest increase has been in New York, — 10 dailies, 29 of all sorts. Illinois and Missouri show a percentage of gain which is even greater, while Colorado leads all others in the percentage of increase, both of daily and weekly issues.

The Quickest Passage from Sandy Hook to Queenstown. — The Servia, the new Cunarder, has made one of the quickest eastward trips across the Atlantic yet accomplished. The particulars of the "run" are as follows: 3.35 P. M., January 18th, passed Castle Garden; at 5.5 P. M. passed Sandy Hook; 19th, moderate breeze, distance run 268 miles; 20th, northerly breeze, 372 miles; 21st, wind easterly, moderate, 380 miles; 22d, easterly light winds, 360 miles; 23d, southerly fresh, distance 392 miles; 24th, southwesterly wind, 402 miles; 25th, southwest breeze, 292 miles; 26th, southwest, 302 miles, to Queenstown; 2.15 A. M. ship's time, passed Fastnet; 5.42 arrived at Queenstown. The apparent time of the passage is 7 days, 12 hours, 39 minutes; and the actual time from Sandy Hook, 7 days, 7 hours, 41 minutes. This is by several minutes the shortest passage on record, notwithstanding that the Cunard route is 90 miles longer than that taken by most of the other lines. It will also be seen that on several days the Servia had easterly winds.

Since the above was in type, we see that the Alaska of the Guion line, between March 21st and 28th, made the passage to Queenstown in 7 days, 6 hours, and 43 minutes.

Some Representative Americans. — The theory that the human race will not be able to maintain a high order of physical development on this continent did not receive much encouragement at a recent social gathering of "tall men" in New York city. The "Titans," a society to which only gentlemen of position and of a stature not below 6 ft. 2 inches are eligible, now numbers about 100 members, largely representative of our oldest and best known American families. Seventy-three Titans sat down together at the recent annual dinner of the society. The tallest measured 6 ft. 6 inches. There were a dozen generals and colonels among them, as many prominent physicians, and a long list of distinguished lawyers and business men.

Assay Commissioners Appointed. — The President has appointed the following assay commissioners to test and examine the weight and fineness of the coins reserved at the several mints during the year 1881, namely: Hon. Wm. B. Allison, United States Senate; Hon. Wm. S. Rosecrans, House of Representatives; Prof. John Towler, Geneva, N. Y.; Rev. Paul A. Chadbourne, Mass.; Prof. Chas. E. Munroe, Naval Academy; Prof. J. E. Hilgard, United States Coast Survey; Dr. Wm. Pepper, University of Pennsylvania; Dr. Le Barron Russell, Boston, Mass.; Dr. W. P. Lawyer, assayer, mint bureau; Anthony J. Drexel, Philadelphia, Pa.; Thomas Donaldson, Philadelphia, Pa.

ATOMS.

An exchange gives a list of thirteen large theatres in Europe which were destroyed by fire during the year 1881.— Paterson, N. J., in proportion to its size, has more one-eyed men than any other city in the United States, except Pittsburgh; nine tenths of those thus afflicted are workers in iron and steel, and have been struck in the eye with the metal chippings. — It is believed that Prometheus was the first victim of a liver-pad. — Inwardly digest these Chinese proverbs: "Learning cannot be gulped down;" "Every subject must be chewed to get out its juice;" "Good students are like workers in hard wood;" "Most things are easy to learn, but hard to master." — The treatment of whooping-cough by mustard-plasters to the spine at night, with cold sponging in the morning, is highly commended in a *Lancet* annotation. — M. Camille Godard has left $20,000 to be devoted to the creation of a botanical garden at Bordeaux, for the use of the Faculty of Medicine; he has also bequeathed an annual sum of $600 for prizes. — It is said that the Queen of Madagascar enforces a penalty of ten oxen and £2 on any person found manufacturing intoxicating drink, and a lighter fine on those who sell and those who drink it. — The German Government appropriates this year over $40,000 for the support of medical education and work in the seven universities of Berlin, Königsberg, Halle, Kiel, Göttingen, Marburg, and Bonn. — It has been estimated that in Great Britain 378,151 persons carry on underground employment, working in galleries extending over 58,744 miles. — It is stated that the latest high-school translation of "*Arma virumque cano*" is "I sing of arms and the virus." — Professor Huxley is said to be engaged on a work on Bishop Berkeley and his contributions to medical and mental science.

Medicine and Pharmacy.

BEEF TEA.

Some time ago, Mr. G. F. Masterman, in the London *Lancet*, called attention to the chemical analysis of beef tea, which shows that it is analogous to urine, except that it contains less urea and uric acid. The analysis also proves that the tea, even when most carefully prepared, does not contain, including alkaline salts, more than from 1.50 to 2.25 per cent. of solid matter, and that such matter is composed mainly of urea, kreatine, kreatinine, isoline, and decomposed hæmatine, exactly the animal constituents of the urine, except that there is but a trace of urea.

Mr. Richard Nealy, in the London *Practitioner*, remarks, —

Many writers have endeavored to impress the public and the profession with the true value of beef tea, namely, that it is not a nutrient, but a stimulant, and that it mainly contains excrementitious materials. It appears, however, of little avail, for you constantly meet with those, even in the ranks of the profession, who believe beef tea to be really a powerful nutriment, while in most cases among the public your positive statement that in milk we possess a far cheaper and more powerful blood and flesh making food than in beef tea is met with a skeptical stare. A short time since, a consulting physician wrote in one of our periodicals how he was not infrequently called to cases where he found the patient literally starving to death in the midst of plenty. Wines and liquors of all choice brands covered the table, with beef tea, jellies, and essence of meats in all their endless varieties, some of which, the consultant was told, were given every half hour, and that therefore the patient had been well kept up. By a speedy clearance of all but the brandy bottle, and with the addition of two or three pennyworth of milk, he had on several occasions rescued a young and valuable life from certain death.

Dr. F. Gibson, in the *British Medical Journal*, has shown how detrimental beef tea may prove in some cases of Bright's disease, where the kidneys are already taxed to the utmost to throw off metamorphosed structures; and yet the metamorphosed structures of the muscles of the cow are superadded, for these very materials, had the animal lived, would have been passed away as urine. Frequently, too, beef tea is advised by practical physicians in diarrhœa, dysentery, and during diarrhœa of typhoid; but Dr. Gibson pronounces it "poison" in such cases.

Dr. Lauder Brunton, referring in the *Practitioner* to the occasional bad effects of beef tea, says: —

We find only too frequently that both doctors and patients think that the strength is sure to be kept up if a sufficient quantity of beef tea can only be got down; but this observation, I think, raises the question, whether beef tea may not very frequently be actually injurious, and whether the products of muscular waste, which constitute the chief portion of beef tea or beef essence, may not under certain circumstances be actually poisonous. For although there can be no doubt that beef tea is in many cases a most useful stimulant, one which we find very hard indeed to do without, and which could hardly be replaced by any other, yet sometimes the administration of beef tea, like that of alcoholic stimulants, may be overdone, and the patient weakened instead of strengthened.

Much additional evidence might be collected with regard to the non-nutritive but valuable stimulating powers of beef tea, but the above must suffice for the present. It may seem strange to some of our readers that it should be even a useful stimulant after what has been said above concerning its chemical resemblance to urine; but several writers have shown that there is no inconsistency here. Indeed, according to these authorities, the medicinal use of urine, common in South American and some other countries, is not altogether absurd. The therapeutical value of urate of ammonia and guano was noticed by Bauer in 1852, who commended their external use in phthisis, and in lepra, morphea, and other obstinate skin diseases. Dr. Hastings, in 1862, advised the excreta of reptiles in the treatment of phthisis. Other facts of the same sort might be given if our limits permitted.

COFFEE, MEDICINALLY AND DIETETICALLY CONSIDERED.

BY C. E. PAGE, M. D.

I.

"The chief constituent of the coffee berry, the alkaloid *caffeine*, — in chemical analysis recognized as identical with that of the tea plant, *theine*, — when separated from the other constituents . . . so as to be seen in its perfect purity, appears in snow-white, silky, filiform crystals, flexible and fragile, without odor, but having a mildly bitter taste. . . . But it remains an important consideration that this crystallized constituent . . . is built on the chemical type of the alkaloids, a class of bodies which nature forms in plants, but not in food-plants, — bodies that include narcotics, stimulants, hypnotics, deliriants, poisons, tonics: some of them affecting the whole nervous system, one to excite and another to depress; and others influencing only parts of the nervous system, for special functions of the body." (Prof. Albert B. Prescott, in *Popular Science Monthly*, January, 1882, "Chemistry of Tea and Coffee.")

It cannot be questioned that the administration of coffee, in the form of an infusion or otherwise, is entirely in accord with the theory and practice of medicine at the present day. It is, however, a fact well known to practitioners, and indeed generally to "laymen," that the constant and long-continued use of any medicine transforms its "remedial" influence into one promotive of disease that may perhaps demand the curative aid of some other drug.

A strong infusion of *café noir* (administered, it is to be presumed, to one not an habitual user) has been recently claimed by a celebrated French physician as an effectual antidote for the blood-poison that exists in typhus, typhoid, and yellow fevers. There are, however, good grounds for the belief that the habitual use of coffee as an article of diet aids materially in the accumulation of the poison, and in the production of that abnormal condition or quality of the tissues of the body which the vital forces seek to rectify by means of the expulsive efforts observed in, or rather which constitute the symptoms of, typhoid and other fevers. Indeed, Dr. Segur, who evidently regards coffee as the nearest approach to the Elixir of Life, claims, as one of the *benefits* resulting from its use, that "it lessens the waste of tissue, and therefore renders less food necessary." Now, to interfere with or hinder any of the normal processes of the organism, especially those most vital to the economy, as, for example, that of the constant breaking down and excretion of the tissues, is not only to invite, but the impairment of these functions in and of itself constitutes, disease. He further says, "After a heavy meal, it relieves the sense of oppression and helps digestion." What it really accomplishes, however, in such cases, is this: by producing anæmia of the stomach, thereby *hindering* digestion, it relieves temporarily, but at great cost ultimately, the sense of oppression produced by a gluttonous meal. By hindering digestion, in this or in any other manner, as, for example, by resuming muscular or mental labor directly after eating, we may prevent or delay plethora, — the surcharge of the blood with nutritive material that results from the rapid digestion of an over-full meal: but later on there will take place in the alimentary tract more or less fermentation of its undigested contents, which, with the foul and noxious gases generated thereby, will, to a greater or less degree, be absorbed into the circulation. Thus we observe the twofold effect of this most delicious and seductive beverage: by "lessening the waste," it prevents the body from remaining sound in its tissues, and causes blood-poisoning from indigestion. For if, by reason of anæmia of the stomach and intestines, the digestive fluids are not secreted in sufficient amount to preserve it, "the food rapidly undergoes chemical decomposition in the alimentary canal, and often putrefies." (Huxley.) This accounts for the gas coming from the stomach and bowels of persons troubled with indigestion and constipation, who frequently complain of a rotten-egg taste in the mouth. "This gas, in its poisonous effect, is similar to hydrocyanic or prussic acid, only not so powerful. It is a very destructive agent in its interference with those vital processes concerned in ultimate nutrition, robbing the blood corpuscles of vitality, and preventing the transformation into tissue of the nutriment conveyed by the circulation, and of worn-out tissue into waste, thus poisoning the blood and nervous centres, and disturbing the whole animal economy." (Jackson.) According to the recent experiments (on dogs) of M. Lennen, communicated to the Paris Society of Biology, coffee does produce "anæmia of the stomach, retards digestion, and, the anæmia repeating itself, ends by bringing on habitual increased congestion of the stomach, which, according to M. Lennen, is synonymous with dyspepsia."

It is not difficult, then, to comprehend why the final effect of coffee must be especially injurious, if not disastrous, to asthmatics and "consumptives," the head and front of whose disease is dyspepsia, pure and simple. (See article on "Consumption," in February number of the Journal.) The *British Medical Journal*, after noting the experiments of M. Lennen, and favoring his conclusions, goes on to say, "It is well known, — and English physicians have laid great stress upon this point, — that the abuse of coffee and tea often brings on gastralgia, dyspepsia, and, at the same time, more or less disturbance of the *apparatus of innervation*." The question naturally arises, What constitutes an "abuse" of a medicine? I should say, Its daily use as a beverage.

Coffee is a *purgative*, — a very agreeable form of breakfast pill, — but, as with about all purgative medicines, an increasing dose is necessary, and its final effect is constipation, with no end of possibilities as a result of the retention of waste matters in the blood. Constipation, however produced, is a *predisposing* cause, and the continuance of the habits that have produced and now maintain it constitutes a sufficient *exciting* cause, of such diseases as neuralgia, rheumatism, erysipelas, fevers of various sorts (including scarlet fever), "head cold" (surfeit fever really), and, with the aid of sewer gas, — *insufficiently diluted with out-door air* by means of ventilation, — diphtheria. Worst of all, those more terrible maladies (because more permanent and enduring, and unrecognized as diseases), as nervousness, peevishness, irritability, and general unreasonableness, are due, in great measure, to impoverishment of the blood; the nerves are insufficiently nourished, and

the brain is "set on edge" by a poisoned circulation.

Professor Prescott makes this very interesting remark with regard to the chemistry of coffee and tea: "But the change of guanine into theine is easily accomplished. It is perfectly practicable to bring guano material to the laboratory, and send away the same atomic elements transformed into the snow-white, silky crystals of theine. Given only sufficient demand for the pure stimulant principle of tea and coffee, and a market high enough above the cost of its vegetable sources, and it might then safely be predicted that not many months would elapse before companies with thousands of capital stock would engage successfully in the chemical manufacture of theine from guano. Then, very likely, rival companies would establish the claim to manufacture a still purer article from certain of the waste substances of the world, — articles more accessible than guano."

As to the nutritive properties of coffee, although the food constituents of the *berry* are considerable in quantity, yet so deficient are they in digestibility that, in the infusion especially, it is more than doubtful if they are of advantage in supporting life, under any circumstances; indeed, I have no doubt that the poisonous effects of the alkaloid and tannin far outweigh any gain from the nutrients. At any rate, he would be a bold man, indeed, and I doubt not a defeated one in the end, who should attempt to imitate Mr. John Griscomb's fast of forty-five days (which was attended by no discomfort even), substituting coffee infusion for pure water.

Coffee is a *diuretic*, and hence its habitual use promotes disease of the kidneys. "Very warm drinks are in themselves debilitating to the stomach, but the addition of the properties of tea, coffee, or other herb, burdens the kidneys and urinary apparatus with an unnatural amount of labor continually. These organs, kept constantly over-excited, must become debilitated, and preternaturally irritable, and this condition of debility and irritability extends sympathetically to all the surrounding viscera; finally, the abdominal muscles themselves become relaxed, and, with the general nervous exhaustion produced by the active nervine and narcotic properties of the herb throughout the system, a foundation is laid for the whole train of maladies, displacements of organs, disordered functions, and 'weaknesses,' which are so general at the present day."

"ÆSTHETICISM" FROM A SCIENTIFIC POINT OF VIEW.

The London *Medical Times and Gazette* of March 11, 1882, has an editorial article on "Æstheticism," which is so thoughtful and suggestive that we cannot refrain from reprinting it, with some condensation: —

Physical beauty and health are one. A person may be healthy without being beautiful; but beauty of the best, most enduring, and most generally admired type depends upon perfect health. It is the result not merely of the health of the individual, but of the physical development transmitted by lines of healthy ancestors. Mr. Herbert Spencer has shown that grace of movement depends upon economy of muscular effort. Symmetry of form means perfect and proportionate development of every part. Beauty of countenance signifies a type of face framed in the past by ancestors whose thoughts were habitually grave, pure, generous; whose perceptions were acute, and their senses cultivated. . . .

During the last few years a picture-gallery has been opened in London in which a certain group of artists have set before the world a kind of beauty which was not that commonly admired. Their productions have been ridiculed by some, enthusiastically welcomed by others. These æsthetes, as teachers and pupils alike are called, are few in number, but they have afforded a clever artist in the pages of *Punch* the opportunity of making much fun at their expense; they have been parodied in a comic opera which has been unusually successful; and they have been held up to contempt in a comedy which has had a long run at another theatre: and therefore, thanks to the artist, the dramatist, and the musician, their peculiarities have become widely known. We suspect, too, that the general opinion — the opinion, we mean, not of the cultivated few, but of the masses of people who have got any idea about æstheticism and æsthetes — is that the peculiarities of the latter are absurd, ridiculous affectations. . . . But it is a general law that no error can spread widely unless it contain some grain of truth. For the "high æsthetic line" to have attracted anybody, it must have had something in it which was true and genuine. . . .

The æsthetic craze, to use a term given to it by the "Philistine" outsiders, seems to us a reaction against muscular Christianity on the one hand, and asceticism on the other. The writings of Thomas Hughes and Charles Kingsley set before the generation to whom they spoke an ideal undoubtedly of high excellence. They glorified physical strength and courage, and inculcated truth and fearlessness as the highest of virtues. The painter who should depict their typical hero would limn something very different from the pallid, hollow-cheeked, sad-eyed beings of the Grosvenor Gallery. But it is the fate of most teachers to find disciples who do more than follow: who go beyond what they have been taught; who adhere to it with a too exclusive devotion, and in their desire to emphasize exaggerate. In the minds of such, the delight in animal vigor, in outdoor life, becomes pushed to the exclusion of intellectual pursuits, the neglect of literature, art, and the influences which refine life. The admiration of courage and of strength leads them to confound gentleness with cowardice, self-restraint and prudence with weakness, liberty with anarchy. The love of outspoken truth takes with such the form of impatience of reserve and reflection, of calm judgment, contempt of thoughtful analysis, want of consideration for the feelings of others. In short, the exaggerated muscular Christian becomes a being strong, brave, and frank, but also a somewhat coarse, impulsive being, wanting, or at least not appreciating, delicacy and refinement.

The type we have just described stands in opposition to the ascetic ideal, and probably the strength and warmth with which its admirers contended for its excellence were increased, if not kindled, by the excesses of asceticism. The ascetics, Catholic and Puritan alike, looked upon body and spirit as separate and opposed, — the former being but a prison in which the latter was for a time enshrined, a clog impeding its upward flight, an ever-present instrument in the hands of the evil one to lure it to perdition. Therefore, in their eyes, physical strength and vigor were sometimes as much a curse as a blessing, and ill-health often an occasion for devout thankfulness. The flesh needed to be chastened, not to be cared for and developed; there was in it no good thing. The talent of the artist was thrown away in depicting mere physical beauty. The aim of education should be to develop the mind, not the body. The "pride of sinful flesh" had to be subdued. . . . The beauty of the female form was that which, above all others, a Christian artist should shrink from painting, and fear even to look at. . . .

Now, as every one knows, these doctrines have been held by many persons of singularly noble character. . . . Nevertheless, they were in one way morbid: they sought to check natural and healthy appetites; to force body and mind into an abnormal, strained, and for the mass of people impossible mode of living. The blind insistence on a life conformed to the ascetic standard, splendid as might be the results produced in those who were strong enough to endure it, yet led on the moral side to deceit and hypocrisy, and on the physical to stunted physical and intellectual development, and not seldom to insanity.

Now, æstheticism may justly be regarded as embodying a revolt against these two opposed and one-sided tendencies, — an attempt to refine the coarseness and materialism which a too muscular Christianity engenders, and at the same time to kindle a healthy delight in physical grace and beauty, and vindicate the enjoyment of the natural appetites. . . . The ascetic gloried in suffering; the æsthete in pleasure and ease. How far the æsthetes, in their turn, have pushed refinement into effeminacy, and the glorification of physical beauty into sensuality, we will not here discuss.

The point which we wish to bring out is this: that in what is called the æsthetic movement there does lie a truth which there may be danger of overlooking. We take it to be this: that perfect beauty and perfect health depend on the due and proportionate exercise of *all* the functions of the body. Muscular strength, courage, truthfulness, cannot be too much admired, nor can habits of self-control be too highly appreciated. But none the less are grace and refinement excellent things; and the happiness which comes from the enjoyment of physical comforts is natural and in the highest degree beneficial.

THE DANGER OF HYPNOTIC EXPERIMENTS.

The many interesting accounts of hypnotic experiments on human beings and the lower animals, which have been given in scientific and medical journals of late, are likely to encourage attempts of the kind for the sake of mere curiosity; and it should therefore be understood that such experiments are not so harmless as they are generally supposed to be. The following, which we take from one of our foreign exchanges, suggests the necessity of caution in this matter: —

Professor Harting, of the Utrecht University, some years since made a great number of experiments in hypnotism on various animals, as fowls, rabbits, pigeons, guinea-pigs, and frogs. But if hypnotism was induced several times in the same animal, it was found that its nervous system became greatly damaged. "I had six fowls," he says, "which at intervals of two or three days were placed in a state of hypnotism; in about three weeks' time one of these fowls became lame, hemiplegia soon after appeared, and the fowl died. It was the same with the five others, so that in three months they were all dead." These experiments ought to render us very circumspect in inducing hypnotism in man; and Professor Brown-Séquard, who had repeated Harting's experiments, declares (*Comptes-Rendus*, February 20th) that by the provocation in hysterical women of phenomena analogous to those which are so fatal to animals we risk doing them mischief. As the result of the observations which he has made, he has reason to believe that persons frequently submitted to this kind of influence gradually become perfect *subjects of demonstration*, thus indicating that by repetition of the exercise of the pathological functions of the nervous system the disease becomes more and more serious. Therefore it is not desirable that hypnotism or other analogous action should be often practised on hysterical subjects.

New Purgatives. — Rambuteau has found, by experimenting upon himself, that sulphophenate and sulphocresylate of soda form mild purgatives in doses of 25 to 30 grams.

MISCELLANEA.

CHURCH BELLS AND DOGS. — The *Lancet* says that in towns church bells are an intolerable and most mischief-working nuisance, and we entirely agree with our valued contemporary. "To the sick, suffering from headache and nervous irritation, the ding-dong and jangle of church bells constitute a very serious annoyance; and we do not hesitate to say, in many cases, the loss of rest and the general disquietude they produce not only lessen the chances of recovery, but may expedite a fatal issue. This is a grave charge, but we make it advisedly."

We might add that dogs which are kept chained frequently make night hideous to the well and unendurable to the sick, and the blood of the victim be upon the head of his neighbor who keeps a howling dog. The incessant rattle of a piano is scarcely less annoying to the invalid and convalescent, but sometimes their owners are sufficiently humane to cease the nuisance when asked to do so; but dog-owners and church sextons rarely possess this virtue, and wise laws should be enacted to protect weak and suffering humanity.

REPORTED FAILURE OF ARTIFICIAL QUININE. — Dr. A. Schapringer, of the Jewish Hospital, Philadelphia, reports that he has tried chinoline tartrate (described in our March number) with poor success. In several cases, in which patients failed to be cured under its action, they were subsequently cured by the use of quinine sulphate in greatly reduced doses. Dr. Cohen's experience was alike unsatisfactory; nevertheless, the remedy deserves further trial.

SALUBRITY IN LARGE HOTELS. — Dr. C. R. Agnew, in a letter to the *New York Medical Record*, says: A sanitarian finds in the population itself of a hotel a condition making a high degree of salubrity impossible. Few people like ventilation, and the majority of the occupants of a hotel demand the exclusion of fresh air from halls, corridors, dining and sitting rooms, and prefer to live in an atmosphere which would poison a toad. At all sanitaria, hotels should be built upon the cottage plan, and those enormous dining-rooms, in which hundreds of human beings congregate to feed, and, meanwhile, pollute each other with crowd-poison, should abolished.

A VICTIM OF "PREVENTIVE MEDICINE." — A man out West feared he was going to have the small-pox, and, believing whiskey to be a preventive, he drank about three quarts of it. A coroner's jury, the next day, rendered a verdict that he "died from excessive prophylaxis."

WHAT'S IN A NAME? — A foreign journal says that "Le Tord Boyaux," manufactured by Guérard & Co., Paris, a non-poisonous rat-killer, much advertised on both sides of the Rhine, is composed of powdered squill, 40 parts, and tallow, colored brown, 60 parts. The inventor states that his article is made from "the fresh bulbs of the Algerian plant, Alaschil-bessal-onsol." He would have been better understood if he had printed, instead of the Arabic, the better known name "Scilla maritima."

MORE DOCTORS WANTED IN ITALY. — Americans travelling in Italy complain that it is almost impossible to get the attendance of a good physician, especially in the larger cities like Rome and Florence. One American lady, while taken ill with typhoid fever in the latter city, could not secure medical attendance except by the special interposition of the consul.

"TRAPS" FROM A COLORED POINT OF VIEW. — An exchange tells this good story: A certain locality at the West End was complained of as not having proper sanitary arrangements, and an officer of the Board of Health was sent to inspect. He found that there were no traps set to prevent the sewer-gas from rising. He ordered the occupant, a colored madame of large proportions, to have traps put in. She assented, and the officer went his way; but according to his custom he made the supplementary visit to see that his order had been carried out. The buxom female received him graciously, and, with much unction, showed him a mouse-trap carefully set under each and every sink in the house.

SELECT FORMULÆ.

FOR DIGESTIVE AILMENTS. — The following are commended by the *Western Medical Reporter* of Chicago: —

(1.) *In oppression from flatulence:* —

℞ Magnesiæ carbonat.	grs. 80
Ext. opii liquidi	min. 30
Spts. ætheris	ʒ ss
Aquæ menth. viridis	ad ʒ 6

Mix. One fourth part when indicated.

(2.) *In dyspepsia with acid eructations and debility:* —

℞ Ammoni. carbonat.	grs. 5
Tinct. aurantii	ʒ 1
Infus. chiratæ	℥ 1
Aquæ	ad ʒ 2

Make a draught, to be taken night and morning.

Or: —

℞ Sodæ bicarbonat	grs. 120
Spts. ammon. aromat.	ʒ 1
Tinct. zingiberis	℥ 1
Infus. gent. co.	ad ʒ 8

Mix. A sixth part three times a day.

(3.) *In pyrosis and gastrodynia:* —

℞ Liq. bismuthi et ammon. citrat.	ʒ 1
Infus. quassiæ	ʒ 1

Make a draught, to be taken three times a day. One drachm of the solution of bismuth is equal to 20 grains of powder.

(4.) *In heart-burn and acid eructations.* The following lozenges are superior to the officinal bismuth lozenges: —

℞ Bismuth subnitrat.	grs. 720
Magnesiæ carbonat.	℥ 2
Calcis carbonat. præcipitat.	℥ 3
Sodæ bicarbonat.	grs. 1800
Sacchari albi	ʒ 14
Acaciæ gummi	grs. 220
Mucilag. acaciæ	℥ 1
Aquæ rosæ sufficient to make a mass.	

Divide into 360 lozenges, and dry them with a moderate heat. From one to six lozenges may be taken at a dose.

MILD TONIC BITTERS. — The *Druggists' Circular* gives the following as a formula with about the minimum of alcohol necessary for keeping well: —

Gentian root	1 ounce.
Cardamom seed	½ ounce.
Tincture of fresh orange peel	2 to 4 drachms.
Alcohol	2½ ounces.
Simple syrup	2 ounces.
Water, sufficient to complete	1 pint.

Mix together the tincture, the alcohol, and five ounces of water, and with the mixture moisten the gentian and the cardamom, previously reduced to a coarse powder. After twenty-four hours' contact, pack the drugs in a percolator, and exhaust them first with the alcoholic menstruum, and then with enough water to complete fourteen ounces of percolate. Add to this the syrup, and filter through paper.

HOP BITTERS. — The *Canadian Journal of Medical Science* says that the following gives an article for about ten cents as good as that sold for a dollar, if not identical with it: —

℞ Tincture of hops	℥ ss.
Tincture of buchu	ʒ iij.
Tincture of senega	ʒ iij.
Podophyllin (dissolved in spirits of wine)	℥ ss.
Tincture of cochineal	gtt. xx.
Distilled water	to O. j. M.

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Special Notices.

GOOD WORDS FOR ADVERTISERS.

Our title-page this month is adorned with a spirited picture which needs no explanation except to call attention to it; as it speaks for itself, and is interesting as showing the large increase of this novel, cheap, and healthy recreation — BICYCLING.

The roads in the suburbs are now getting in good condition, and early and late can be seen many a rider who has "run over with a wagon wheel."

Our readers in the country at this season are no doubt planning their vegetable and flower gardens. These important comforts and luxuries should be attended to early, and we take pleasure in calling attention to the advertisement of Messrs. Everett & Gleason on page 5, whose reputation for fair dealing needs no indorsement from us.

The Italian proverb says: "Hear, see, and say nothing, if you wish to live in peace." But when we know we have the best pens in the world we can't keep quiet, but must let the public know of it. THE ESTERBROOK STEEL PEN CO.

Murdock's Liquid Food seems to be making quite a stir in the market just now, and an advertisement on page 6 gives some account of its usefulness. Good results are claimed for it by the proprietors, and they court the closest scrutiny into its merits.

A new advertisement of *Silicated Carbon Filters* appears on page 8, to which the attention of our readers is earnestly called. The testimony of some of the most eminent chemists of London is appended, and it would seem to add overwhelming evidence of their usefulness. A sample of the Filter can be seen at our office, and we intend to give it a trial, and, after making an analysis of the water before and after it passes the filter, give the results of the analyses to our readers.

We passed a few days in New York last week, and found that the *Metropolis* was keeping up to its historic record evinced by the notices of removal of many of its citizens, many times to newer and more spacious quarters. Our old friends Meyer and Richards & Co. have taken a hegira, the former to 11 Dey Street, and, by consulting page 5, it will be seen that Richards & Co. can now be found at Fourth Avenue, opposite Sixth Street.

☞ On the second page of the JOURNAL will be found the notice of the removal of Mr. Curt W. Meyer, of New York, the manufacturer of Improved Holtz Electrical Machines, the Students' Electrical Cabinet, and various other physical and chemical school apparatus. We have often spoken of the good work Mr. Meyer is doing in bringing practical electrical apparatus within the reach of all, and as his ambition is to introduce the Study of Electricity more generally among the young, wish him every success in his new and spacious quarters at 11 Dey Street, near Broadway, New York City.

HORSFORD'S ACID PHOSPHATE. — LIVER AND KIDNEY DERANGEMENTS. — Boston, Mass., *May* 19, 1880. — In regard to the Horsford's Acid Phosphate, I have used it very extensively, and with the most remarkable success. I give it in dyspepsia and in all cases where there is derangement of the liver and kidneys. With my patients it has agreed wonderfully.

O. G. CILLEY, M. D

GOOD WORDS FROM SUBSCRIBERS.

CHARLOTTEVILLE, N. Y., *Dec.* 24, 1881

JOURNAL OF CHEMISTRY Co:

I have taken the JOURNAL OF CHEMISTRY from its infancy, and am well satisfied with it. I think that there is more general scientific knowledge in the JOURNAL than in any other periodical published.

DR. H. SPERBECK.

Boston Journal of Chemistry
AND
POPULAR · SCIENCE REVIEW.

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Familiar Science.

COMETS AND METEORS.

III.

IT has already been stated that comets and meteors are shown to be related bodies, from the fact that the orbits of several of the meteoric groups, which are the sources of periodical "showers," are identical with the orbits of certain comets. We find the meteors travelling in the track of the comet, and seeming much like fragments of the flabby, loose-jointed monster, which have somehow become detached and left straggling behind in his flight through space. We might suppose that in the lapse of ages the great tenuous mass would be entirely disintegrated in this way, and nothing but a long train of meteors remain to mark its blazing pathway. Have we any evidence that any comet has thus gone to pieces?

In the year 1826 a small comet was discovered, which is sometimes called Gambart's, but is more generally known as Biela's comet. It was found to have a period of about six and two thirds years, its perihelion being somewhat inside the earth's orbit, or about 82 millions of miles from the sun, and its aphelion beyond the orbit of Jupiter, or some 585 millions of miles from the sun. It was an insignificant specimen of its class, but was destined to make a greater sensation than some of its more brilliant brethren.

The first reappearance of the comet, in the fall of 1832, caused no little excitement from the announcement that it was likely to come in collision with the earth. More careful calculation, however, showed that the comet would cross the orbit of our planet a full month before she would reach the junction, so that it was quite unnecessary to send a red flag ahead as a danger signal. Timid folk then suggested that the contemptible little comet might somehow "derange the orbit" of the earth, and thus indirectly do her mischief, even if an actual collision was out of the question; but Arago and other astronomers of the time ridiculed this notion, and the popular alarm gradually subsided. No doubt some good people were not thoroughly comfortable until the dreaded visitant had got well out of the way, and the earth was found to be running steadily "on time" as of old.

Of the next return of Biela's comet history makes no important record, but when it came back again in 1845 it astonished the world, both scientific and unscientific, even more than it had frightened the latter portion thirteen years earlier. The earth was in no possible danger this time, but what had happened to the comet? When astronomers turned their telescopes towards it, some three months after its return, instead of one comet, they were startled to see *two* comets, travelling side by side. If this had been the report of a single observer, it might have been suspected that the duplicity was "all in his eye," and that it was to be explained as such temporary peculiarities of vision generally are; but all the astronomers saw the comet double, and it was preposterous to suppose that they were all inebriated. Sober scientific eyes were directed at the mysterious bodies from all parts of the earth, and it was certain that there were two of them. Figure 1 shows the pair as seen

Fig. 1.

on the 19th of February, 1846. It was in January that the division of the comet was first observed. In November and December it had appeared as usual, with nothing remarkable about it.

At first the two parts were of very unequal brightness; then the smaller increased, until it was as conspicuous as the other; it then grew fainter, and was finally lost to view a month before its companion. The two were about two hundred thousand miles apart, or nearly as far as from the earth to the moon.

The next visit of the twin comets, in 1852, was watched for with much curiosity. Would they both come back, or might there be more of them? If one such split had occurred, why might not another? The calculated period of return arrived, and there were the two comets as in 1846, only they were now considerably more than a million miles apart. As before, their comparative brightness varied at times, and it was impossible to decide which was the principal comet. Figure 2 shows them as they

Fig. 2.

appeared at one time during this visit. They finally passed out of sight in September, 1852, and that is the last that has been seen of them. In 1859 there was little hope of detecting them, on account of the unfavorable position of the earth; and in 1865 they might have escaped detection because of their distance from us. In 1872, however, the conditions were extremely propitious for seeing them, but they were sought for in vain. The poor comet has pretty certainly been broken up, and nothing is probably left of it but a train of meteors scattered along its former orbit.

As might naturally be anticipated, astronomers were on the watch for these meteoric remnants of the lost comet. It was calculated that the latter would have crossed the earth's orbit in September, 1872, at a point which the planet would reach somewhat more than two months later. It might be expected that we should have a meteoric shower at that time, and that its radiant point would be in the constellation Andromeda, that being the direction from which bodies moving in the comet's orbit would seem to come. The shower came off as predicted, and the radiant point was in Andromeda. The meteors were not very abundant nor very brilliant, but we cannot doubt that they were fragments of Biela's comet.

These facts, taken in connection with those before given concerning the meteoric showers of August and November, are ample to establish the assumed relation between comets and meteors. Some comets, at least, must be nothing else than dense groups of the minute bodies which are burnt up as shooting-stars in the upper regions of our atmosphere; and it is probable that all comets are chiefly composed of such bodies. The nucleus of large and brilliant comets may be a solid mass, or an aggregation of solid masses, like the aerolites; but such cases are probably the exception, to the general rule.

It may be added that, though the division of Biela's comet is the only well-authenticated instance of the kind, there is reason to suspect that it is not the first one. Sundry observations of double comets had previously been reported; but as the comets did not return, the duplicity could not be verified, and was not generally credited.

It is also well known that certain comets which have returned have apparently lost much of their ancient splendor; and this may possibly be due to partial disintegration. Halley's comet was one of extraordinary brilliancy in 1456. It has seemed to be waning ever since, and at its last visit, in 1835, was a comparatively insignificant affair.

The phenomena of the tails of comets likewise indicate a continual loss of matter. That some evaporating process is going on from the nucleus is proved by the movements of the tail. It is evident that this cannot be an appendage carried along with the comet, as it seems to be. It is impossible that there should be any cohesion in matter of such tenuity that the smallest stars could be seen through a million miles of it, and which is, moreover, continually changing its form. Then, again, as a comet is passing its perihelion, the tail appears to be whirled from one side of the sun to another with a rapidity which would tear it to pieces if the movement were real. The tail seems to be, not something attached to the comet, and carried along with it, but a stream of vapor issuing from it, like smoke from a chimney. The matter of which it is composed is continually streaming outwards, and continually being replaced by fresh vapor from the nucleus.,

The vapor, as it emanates from the nucleus, is repelled by the sun with a force often two or three times as great as the ordinary solar attraction. The most probable explanation of this phenomenon is that it is a case of electrical repulsion, the sun and the particles of the cometary mist being similarly electrified. With reference to this theory of the formation of comets' tails, the late Professor Peirce remarks: —

"In its approach to the sun, the surface of the nucleus is rapidly heated; it is melted and vaporized, and subjected to frequent explosions. The vapor rises in its atmosphere with a well-defined upper surface, which is known to observers as an *envelope*. . . . The electrification of the cometary mist is analogous to that of our own thunder-clouds. Any portion of the coma which has received the opposite kind of electricity to the sun and to the repelled tail will be attracted. This gives a simple explanation of the negative tails which have been sometimes seen directed towards the sun. In cases of violent explosion the whole nucleus might be broken to pieces, and the coma dashed around so as to give varieties of tail, and even multiple tails. There seems, indeed, to be no observed phenomenon of the tail or the coma which is not consistent with a reasonable modification of the theory."

Professor Peirce regarded comets simply as the largest of the meteoroids. They appear to shine partly by reflected sunlight, and partly by their own proper light, which seems to be that of vapor rendered luminous by an electric discharge of slight intensity.

Comets have been examined in several instances with the spectroscope, and the spectrum obtained appears to be identical with that of certain hydrocarbon vapors; but further investigation is necessary before this can be considered as absolutely settled.

We have by no means exhausted the subject of meteors and comets, but our limits forbid dwelling upon it further at present. If the recently discovered comet should become as conspicuous an object this summer as certain astronomers have predicted it will, we may have something to say about it.

EGGS AS FOOD.

EGGS, at average prices, are among the cheapest and most nutritious articles of diet. Like milk, an egg is a complete food in itself, containing everything necessary for the development of a perfect animal, as is manifest from the fact that a chick is formed from it. It seems a mystery how muscles, bones, feathers, and everything that a chicken requires for its perfect development are made from the yolk and white of an egg; but such is the fact, and it shows how complete a food an egg is. It is also easily digested, if not damaged in cooking. Indeed, there is no more concentrated and nourishing food than eggs. The albumen, oil, and saline matter, are, as in milk, in the right proportion for sustaining animal life. Two or three boiled eggs, with the addition of a slice or two of toast, will make a breakfast sufficient for a man, and good enough for a king.

According to Dr. Edward Smith, in his treatise on "Food," an egg weighing an ounce and three-quarters contains 120 grains of carbon, and seventeen and three-quarter grains of nitrogen, or 15 25 per cent. of carbon and two per cent. of nitrogen. The value of one pound of eggs, as food for sustaining the active forces of the body, is to the value of one pound of lean beef as 1584 to 900. As a flesh-producer, one pound of eggs is about equal to one pound of beef.

A hen may be calculated to consume one bushel of corn yearly, and to lay ten dozen or fifteen pounds of eggs. This is equivalent to saying that three and one tenth pounds of corn will produce, when fed to a hen, five sixths of a pound of eggs; but five sixths of a pound of pork requires about five pounds of corn for its production. Taking into account the nutriment in each, and the comparative prices of the two on an average, the pork is about three times as costly a food as the eggs, while it is certainly less healthful.

EXPERIMENTS FOR YOUNG CHEMISTS.

BY PROF. E. J. HALLOCK, PH. D.

IX.

PHOSPHORUS.

GREAT care is to be observed in handling and keeping this dangerous substance. Always cut it under water, handle it only with forceps, and when it is desired to burn it, dry it with a piece of blotting or filter paper. To make phosphuretted hydrogen, take a small short-necked flask, and fit it with a good cork and delivery tube. Fill the flask with water, and put in a piece of "stick potash" (potassic hydrate), and as soon as it has dissolved throw in three pieces of phosphorus as large as peas. If the flask is quite full the cork may be pressed in so that the water will fill the delivery tube. It is *absolutely necessary* to have the apparatus full of water so as to exclude *all the air*. Let the open end of the tube dip under water in some shallow dish. On gently heating the flask the phosphorus will melt, and finally a gas will be given off, which will drive the water from the delivery tube At first only smoke will rise from it, but soon a slight explosion will attend each bubble of gas as it escapes, a flash will be seen, and rings of smoke will rise. Avoid draughts of air, and do not heat strongly enough to make the pieces of phosphorus boil up into the tube, as they may stop it up and cause an explosion. Be careful to let the flask cool very gradually when the experiment is at an end, and do not open it until cold.

Dissolve a piece of phosphorus in carbon disulphide, and preserve it in a tightly stoppered bottle. Place half a gram of powdered potassic chlorate upon a brick or porous tile, and pour some of this solution on it, taking care not to bring a light near the carbon disulphide. When sufficient time has elapsed for the liquid to evaporate, stir the mixture with a long rod, keeping at a safe distance. The explosion will be loud and sudden.

SILICON.

Fill a tall narrow jar or large test-tube to the depth of three centimeters with water-glass (sodic silicate), then add three times as much water, and mix. Drop into it a few crystals of ferrous sulphate not larger than peas. In half an hour green threads will be seen rising from the crystals, and in a few hours they will have the appearance of vegetation. If the vessel is closed and not shaken, this curious substance may be preserved for weeks.

Put some water-glass in a saucer, and pour upon it an equal quantity of strong sulphuric acid. Before the two liquids have had time to mix, pour them slowly out into another dish. A jelly-like substance, pure silicic acid, will be formed, and assume the appearance of icicles or stalactites. Wash and dry this substance, and it will be found to consist of an impalpable white powder.

BORON.

Make a saturated solution of borax in hot water; on cooling crystals will form. Pour off the mother liquor, and add to it some strong sulphuric acid. On cooling, crystals of quite another sort will form. The latter are pure boracic acid. Touch a hot wire, bent to an eye at one end, to some of the crystals, after drying them, and bring them into the flame of an alcohol lamp or the Bunsen gas-burner. They melt and color the flame *green*. The borax crystals also melt to a bead, after first swelling up and turning white. They impart a yellow color to the flame, like common salt. This is because they contain soda; borax is a biborate of soda. A mixture of borax and glycerine brought into the flame will take fire, and then on removing it from the gas flame, a small green flame will be seen to hover over the bead thus formed. This is a good test for borax. Clean the wire, and form a bead of borax as at first, without glycerine; then touch it to some salt of cobalt, and heat again. This will give it a fine blue color. Iron

colors it green or brown; manganese, a deep purple.

CONCLUSION.

In concluding these few simple directions for experimenting on a small scale, the author would repeat that they are not intended for "lecture experiments," but to be performed by each student on his own desk or work-table. It is hardly necessary to say that the teacher will modify the course to suit the age and condition of the student, omitting the mathematical calculations with the younger ones, adding to them for those more advanced.

Considerable attention should be given to the construction of apparatus, bending glass tubing, and making neat work which shall be perfectly tight. Neatness and order must be insisted upon everywhere and at all times.

If it is desired to extend the course beyond the non-metals, which have engaged our attention here, any good text-book will furnish the necessary hints. Qualitative analysis may also follow. In a class of medical students, special attention would be directed to testing for mercury, arsenic, and other poisons, and particularly to the preparation of suitable antidotes, such as the ferric hydrate used in cases of poisoning by arsenic. Attfield's treatise on chemistry furnishes all the information needed for this purpose, as also for urine analysis

In technical schools, experiments with dyes and mordants, in making and analyzing alloys, in the manufacture of ink or soap, filtration and purification of water, and similar operations, will suggest themselves to the practical chemist.

Where it is desired to enter the field of modern organic chemistry there is no better book in our language than that of H. C. Jones, while for organic proximate analysis Professor A. B. Prescott's work is invaluable. It must not be forgotten, however, that in chemistry good teachers are more important than text-books, and the best books fail in the hands of the incompetent.

THE OBSERVATORY ON MOUNT ETNA.

The famous Hospice of St. Bernard, which is 8120 feet above the level of the sea, has hitherto enjoyed the distinction of being the most elevated building in Europe which is inhabited the year round; but it is now to be deprived of that honor. During the past year the city authorities of Catania, in Sicily, have caused to be erected near the summit of Mount Etna an astronomical observatory, which stands 2943 meters above the sea-level, or fully 1000 feet higher than the Hospice of St. Bernard. The structure is nine meters (of 39.37 inches each) in height, and covers an area of 200 square meters. It consists of an upper and a lower story, and is built in a circular form. In the lower story there rises a massive pillar, upon which is placed the great refracting telescope. This story is divided into a dining-room, kitchen, and store-rooms. In the upper story there are three bedrooms, intended for the accommodation of astronomers and tourists visiting the establishment. The roof consists of a movable dome. From the balconies of the upper story a prospect of vast extent and grandeur is presented. The spectator is able to see over half the island of Sicily, the island of Malta, the Lipari Isles, and the province of Calabria, on the mainland of Italy. The observatory is erected upon a small cone, which will, in the case of eruption, protect it completely from the lava-streams. In this respect its situation resembles that of the observatory on Vesuvius, which has stood unharmed through several great eruptions that have poured their fiery streams of lava on either side of the ridge on which it stands.

SCIENTIFIC BREVITIES.

Effect of Compression on Solids. — A German chemist has recently published an interesting memoir, giving the results of a series of experiments as to the effect of powerful compression on various bodies. The substances experimented with were taken in fine powder, and submitted in a steel mould to pressures varying from 2000 to 7000 atmospheres, or about 7000 kilograms per square centimeter. Lead filings, at a pressure of 2000 atmospheres, were transformed into a solid block, which no longer showed the least grain under the microscope, and the density of which was 11.5, while that of ordinary lead is 11.3 only. At 5000 atmospheres the lead became fluid, and ran out through all the interstices of the apparatus. The powders of zinc and bismuth, at 5000 to 6000 atmospheres, gave solid blocks having a crystalline fracture. Toward 6000 atmospheres zinc and tin appeared to liquefy. Powder of prismatic sulphur was transformed into a solid block of octahedric sulphur. Soft sulphur and octahedric sulphur led to the same result as prismatic. Red phosphorus appeared also to pass into the denser state of black phosphorus. A certain number of pulverized salts solidify through pressure, and become transparent, thus proving the union of the molecules. At high pressures the hydrated salts, such as sulphate of soda, can be completely liquefied. Various organic substances, such as fatty acids, damp cotton and starch, change their appearance, lose their texture, and consequently undergo considerable molecular change.

Mechanical Equivalent of Heat. — It does not appear to be generally known that the value of the mechanical equivalent of heat has within a few years been corrected. It is generally referred to by mechanical writers at 772 foot pounds. Dr. Joule repeated his famous experiments in 1876, nearly six years ago, with extraordinary precautions, and the mean result of 60 experiments gave 774.1 foot pounds, with a possible error of 1.400, on account of the "thermometric scale error." This value should be used in all calculations relating to the value of heat as a motive power.

Man and the Brutes. — Dr. Lindsay, in his recent book on "Mind in the Lower Animals," remarks that, "even as regards man himself, it must be borne in mind that there are countless thousands — many whole races — that are intellectually and morally the inferiors of many well-trained mammals, such as the chimpanzee, ourang, dog, elephant, or horse; or birds, such as the parrot, starling, magpie, jackdaw, and various crows."

An Illuminated Buoy. — These floating lamps are thus described by a recent writer: The buoy is a compact wrought-iron vessel, which serves as a receiver of compressed gas. The duration of the flame depends upon the size of the buoy. Some in use in Europe have been made to burn 30 days, and some 120 days. It is said that a buoy of sufficient size will contain gas enough to furnish the light for one year. During that time the flame is steady and constant night and day, requiring no attention whatever after once put in operation. The lantern attached to the buoy admits air enough to feed the flame, but not a particle of water can enter. The most violent gales, the greatest force of the waves, submerging even beneath them, has no effect upon this light. It burns with undimmed brightness as long as gas is in its reservoir. The light, it is said, can be thrown six or seven miles in clear weather. Salty deposits are not made on the glass of the lanterns, as has been demonstrated. The refilling of the buoy at certain intervals is performed by a tender, and requires but a few minutes' time. It is done by passing the gas from a storeholder, which contains the gas compressed to ten atmospheres, by means of a flexible tube into the buoy at a pressure of six atmospheres.

Aboriginal Tobacco Pipes. — It is impossible, says Mr. Edwin W. Barber, in the *American Naturalist*, to determine what was the earliest form of the tobacco pipe. The oldest examples of which we possess any knowledge have been exhumed from the mounds of the Mississippi Valley. They are usually made of stone of great hardness, but we have no reason to believe that this material was always employed in their manufacture. It is not to be supposed that the symmetrical and highly finished specimens which the mounds have produced were the results of the first savage conception of the narcotic utensil. Indeed, it is more than probable that the most ancient pipes were fashioned from wood or other perishable substances, all traces of which have long since disappeared.

White Objects under Electric Light. — In a recent lecture Dr. Werner Siemens, says: "It has certainly been proved by direct comparison of sunlight with electric light, that a white object electrically illuminated, compared with one illuminated by sunlight, appears yellowish, whereas illuminated by gaslight it looks red. The illusion arises from our being accustomed to see the earth redly illuminated after sunset, and on this basis forming a different scale of colors for ourselves. Daylight would accordingly by night appear still bluer than the electric light. This false idea would disappear if electric illumination became general." He considers, however, that meanwhile the objection to lighting theatrical stages with the arc light is reasonable.

Fine Drilling. — Prof. Edward C. Pickering, of Harvard College, says that, in undertaking to measure the intensity of the light of the satellites of Mars, he had occasion to need an extremely small hole. A hole about the *twenty-five hundredth* part of an inch in diameter was finally secured.

HOUSEHOLD HINTS.

Cleaning Hair-Brushes. — Many handsome hair-brushes are spoiled by careless washing. Try the following plan: Comb out the brush; have ready a basin of warm water which has a tablespoonful of ammonia in it. With the face downwards, dip in the brush, but do not let the water touch the wood or ivory back; then rub the bristles with a little soap, and wave the brush to and fro through the fluid; when cleansed, dip it into cold water; afterwards shake, rub the frame, and let the bristles dry in the air or in a warm room, but not before the fire, lest the back should warp or become unglued.

Sticky Fly-Paper. — This may be prepared by applying to stiff paper a thin layer of the following mixture, previously melted together and liquefied by a gentle heat: —

Resin	100 parts
Turpentine or Burgundy pitch . . .	50 "
Rapeseed oil or linseed oil	65 "

To Clean and Revive Polished Furniture. — A piano-maker gives the following directions for removing finger-marks from and restoring lustre to highly-polished but much-defaced furniture: Wash off the finger-marks with a cloth — or, better, a chamois skin — wet with cold water; then rub the

surface with nice sweet oil mixed with half its quantity of turpentine. A liberal rubbing with a very small quantity of this mixture will reward your labors.

Practical Chemistry and the Arts.

COLD SOLDERING.

VARIOUS nostrums have been proposed from time to time which profess to be reliable methods of soldering without heat; but when tried they have generally proved useless. The following recipe, published in the *English Mechanic*, is from Mr. Fletcher, of Warrington, well known for his gas furnaces and other apparatus, and it will probably be found to be trustworthy: —

It must be borne in mind that, though the first preparation is tedious, a large quantity of the materials can be made at once, and the actual soldering process is as simple and quick as it well can be.

Flux: One part metallic sodium to 50 or 60 parts mercury. (These combine on being well shaken in a bottle. If this is too much trouble, the sodium amalgam can be bought, ready made, from any chemist or dealer in reagents.)

This sodium amalgam must be kept in a stoppered bottle closed from the air. It has the property of amalgamating (equivalent to tinning by heat) any metallic surface, cast-iron included.

Solder: Make a weak solution of sulphate of copper, about 1 ounce to 1 quart of water. Precipitate the copper by rods of zinc; wash the precipitate two or three times with hot water; drain the water off, and add for every 3 ounces of precipitate 6 or 7 ounces of mercury; add also a little sulphuric acid to assist the combination of the two metals. When combined they form a paste which sets intensely hard in a few hours, and this paste should be made, whilst soft, into small pellets.

When wanted for use, heat one or more of the pellets until the mercury oozes out from the surface in small beads; shake or wipe them off, and rub the pellet into a soft paste with a small mortar and pestle, or by any other convenient means, until it is as smooth and soft as painter's white lead. This, when put on a surface previously amalgamated by the sodium and mercury, adheres firmly, and sets perfectly hard in about three hours. The joint can be parted, if necessary, either by a hammer and cold chisel, or by a heat about sufficient to melt plumber's solder.

TESTING THE PURITY OF GUANO.

A CHEMIST gives, in the *English Mechanic*, the following practical hints on this subject: —

In 1877, being engaged in the collection of diatomaceæ, I turned my attention to those contained in guano. After much difficulty I obtained half a dozen samples of pure guano, through a friend connected with the trade, and, having subjected them to the ordinary process, modified in the manner I will describe, I took the mean quantity of diatoms contained in a measured quantity of each sample as a standard.

(1.) One drachm of the guano is agitated with a gallon of water and allowed to stand 3 hours, and the water poured off.

This is repeated; and should the water be much discolored after standing the second time, the sample is impure.

The water being then poured off, the sediment is put into a large test-tube, by washing out the vessel in which it was contained with portions of 3 ounces of water. When the whole 3 ounces with the sediment is in the test-tube, it is then well shaken and left to stand one hour; the water is then poured off.

(2.) Add hydrochloric acid (fort.) to the sediment till effervescence ceases; then pour it off, add half an ounce of fresh acid, and boil for two hours.

(3.) Wash again, as in (1).

(4.) Repeat (2), substituting nitric for hydrochloric acid.

(5.) Repeat (1); then pour off the three ounces of water after standing one hour; add one ounce of water to the residue; stir briskly with a glass rod, and while the sediment is in motion place one drop on a slide, spread out with a needle, and dry with a gentle heat. Six slides being thus prepared, the mean quantity of diatoms is compared with the same quantity in the pure standard sample. The result is the quantity of pure guano in that under observation.

Each step in this process is a rough analysis of the guano; the purity is in proportion to the absence of color of the water after washing.

The greater the effervescence with hydrochloric acid, the more phosphates, etc., especially soda and calcium; with nitric acid, the more potash.

INDUSTRIAL MEMORANDA.

A NOTABLE BRIDGE. — A stone bridge, to be built at Minneapolis, Minn., bids fair to become one of the notable structures of the world. According to an exchange it will consist of 16 80-foot spans and four 100-foot spans, and, including the shore pieces, will have a total length of 1900 ft. It will support two railway tracks at a height of 60 ft. above the water, and will run diagonally across the river below St. Anthony's Falls. The cost is estimated at nearly $500,000. This will be a remarkable bridge, truly; but so far as length of span is concerned, the Cabin John bridge, or Union Arch, near Washington, D. C., exceeds it, being a granite arch of 220-ft. span, the longest stone arch in existence. This bridge is 101 ft. high and 20 ft. wide.

AMMONIATED SUPERPHOSPHATES. — In some of the London gas works the extraction of ammonia from crude coal gas is accomplished by passing it over ordinary superphosphate of lime. This process is designed to do away with the scrubbers and washers which are necessary when water is used for the absorption of the ammonia. The superphosphate, before being placed in the purifiers, is damped with ammoniacal liquor to insure its complete alkaline reaction. Its effect on the gas is said to be marvellous. The ammonia is completely absorbed, and the action continues during a lengthened period. The value of the saturated superphosphate as a fertilizer is of course proportionately enhanced.

OIL ON WOODWORK. — Carefully-conducted experiments have demonstrated the fact that seasoned wood, well saturated with oil when put together, will not shrink in the driest weather. Wheels have been known to run many years, even to wearing out the tires. Very many dollars might be saved annually if this practice was adopted. Boiled linseed oil is the best for general use, although it is now known that crude petroleum on even old wheels is of great benefit.

MUTUAL ANTAGONISM IN WOODS. — It is interesting, and it may be instructive to some, to learn that certain kinds of wood, although of great durability in themselves, act upon each other in such a way as to produce mutual destruction. Experiments with cypress and walnut and cypress and cedar prove that they will rot each other while joined together, but on separation the rot will cease, and the timbers remain perfectly sound for a long period.

SELENIUM AS A HEAT REGULATOR. — The sensitiveness of selenium to radiation is to be made use of in regulating the heat of muffle furnaces. The concentration of rays, more or less, upon selenium influences the electric conductivity of the material, as most people know, in a marked degree, and this property M. Germain proposes to make use of to control the heating of furnaces. A window in the furnace, made of very refractive alumina glass, permits the red glow to reach a distant mirror; the rays are reflected upon selenium, and when the light reaches a certain stage of brightness the electric action of the selenium conductor is such that it acts on a mechanical arrangement by which the fire-bars of the furnace are withdrawn. The fuel of the furnace is thus allowed to fall out as soon as the right temperature for fusing enamels has been reached. The *Photographic News* says: If a self-acting selenium actionometer of this kind will permit the firing of enamels with certainty, photographers will not be slow to avail themselves of it.

ELECTRIC LIGHT IN LONDON. — The present condition of the electric light in London is: Streets are now being lighted with it at one fourth of the price of gas; incandescent lamps can be introduced into every room of any house so soon as the mains are laid; there can be a separate meter to each house; the lamps can be separately lighted and put out by turning a cock; if one light goes out no other one is affected; the subdivision is so complete that there is no glare, and yet a room with incandescent lamps is far more brightly lighted than with an equal number of gas lamps, and an equal amount of candle-power produced by electricity is cheaper than if produced by gas. In addition, the electric light has no odor, it does not vitiate or heat the air, nor does it, like gas, tarnish paint and decoration.

HARD PAPER. — It is said that paper made from strong fibres (as linen) can now be compressed into such a hard substance that it cannot be scratched with anything but a diamond. In view of this fact, the *Papier Zeitung* considers that, before long, a great variety of house furniture will be made of paper instead of wood.

OIL FROM PINE. — An important industry, according to *La Nature*, has sprung up within the last few years in the French department of Landes. It consists in extraction and applications of oils from pine. These oils are of two sorts: the heavy (pinoleum), obtained by distilling the resinous wood at a low temperature, and used for painting and wood-preserving; and the light oil for illumination, got by distilling in special apparatus, and purified with chemical agents. This light oil has the same chemical composition as oil of turpentine ($C_{20}H_{16}$), and distils at the same temperature (150° to 160°), but has the advantage of not resinifying. It contains neither pinic nor sylvic acid. As it does not emit vapors except at a high temperature, its use for lighting purposes is quite safe. Its luminous intensity is greater than that of petroleum; it contains 88 per cent. of carbon, while petroleum has 82 per cent. Two similar burners showed the pine oil to have an advantage of 33 per cent. in luminous intensity; the consumption was also less. In the department of Landes roots and old stumps of pine, formerly unutilized, are now made to render considerable quantities of oil.

PILE-DRIVING BY ELECTRICITY. — The successful application of electricity in new fields of labor continues to be recorded. At Hatfield Park, the seat of the Marquis of Salisbury, the piles to support a coffer dam across the River Lea have just been successfully driven by the power of a water-wheel situated at a distance, which power was transmitted by two dynamo-machines to the gearing connected with the pile-driver, of ordinary construction, erected on a barge floating in the river. The machinery worked well, lifting a monkey weighing about four hundred-weight with ease and regularity. It is not stated how far the power was transmitted. By a French experiment M. Deprez has succeeded in obtaining useful work after the current has passed through forty-nine miles of ordinary telegraph wire.

LABORATORY NOTES.

FUSEL OIL. — It is said that fusel oil, which is accused of being the deleterious part of whiskey and brandy, may be detected in quantities of not less than one half per cent. in ordinary alcohol, by placing the latter in a long test-tube, and dropping in a few fragments of potassic iodide, at the same time agitating gently. Fusel oil being present, a slight yellow coloration makes its appearance in a few minutes. Heat assists the action of the test.

TEST FOR COTTON-SEED OIL IN OLIVE OIL. — By order of the Italian government the revenue officers are to employ the following test for detecting the adulteration of olive oil with cotton-seed oil: Two cubic centimeters of pure nitric acid are mixed with 5 cc. of the suspected oil; a piece of clean copper wire is then introduced, and the mixture stirred with a glass rod. If it contains cotton-seed oil it turns red in the course of half an hour.

QUANTITY OF PLANT-FOOD IN TOWN REFUSE. — The town refuse of Groningen was found by Fleischer to contain on the average: —

Nitrogen	0.60 per cent.
Potash	0.24 "
Phosphoric acid	0.50 "

In the Bremen compost, pail system, he found the following: —

Nitrogen	0.52 per cent.
Potash	0.26 "
Phosphoric acid	0.15 "

A CAUTION AS TO THE USE OF SODIUM FOR ALLOYS. — When an alloy, lead, tin, or other metal, is made with sodium in a melting-pot, great care must be used in subsequently freeing that melting-pot of every trace of sodium before using it for melting tin in it, with a view to tinning copper or bronze articles; otherwise these articles, when placed in the melted tin, will be rapidly eaten away. This has been recently proved by accident, but it might have been expected from known facts concerning sodium alloys, which were long ago pointed out by Mr. Mallet, who showed, among other things, that if a strip of iron be coated with sodium amalgam and dipped into a pot of, say, molten tin, the iron will disappear before it can be put to the bottom of the pot.

PRACTICAL RECIPES.

TO CLEAN SILVER PLATE. — A solution of hyposulphite of soda, applied with a soft brush, is said to be one of the best means of cleaning silver or silver-plated goods. No powder being necessary, there is no fear of filling the chiselling or other intaglio ornamentation. When powders are not objectionable, tripoli may be employed, with or without ammonia. In place of tripoli the fossil silica found in this country, and sold under a variety of names, serves an excellent purpose.

BLACK VARNISH FOR LEATHER. — A varnish of this kind, which is said not to crack or peel off, may be prepared thus: —

Rosin	30 parts.
Turpentine	30 "
Oil of turpentine	30 "
Sandarac	60 "
Shellac	120 "
Alcohol (90%)	900 "

Digest, then add

Lampblack, previously triturated with a little alcohol	15 "

INK FOR RUBBER STAMPS. — The following is said to be a good ink for use with rubber stamps: aniline violet 90 grains, boiling rain-water 1 oz., to which is added a little glycerine, and a small quantity of treacle. The quantities of the last two ingredients will vary with the season, but half a teaspoonful will be ample for the quantities of violet and water specified.

Agriculture.

DRIED FODDER AND FRUITS.

IT is apparent that a persistent belief prevails among farmers that the nutrient principles of forage crops and fruits are lost in the process of drying. An error so mischievous in its tendencies should be dissipated, if possible, and at once. Mr. C. M. Hovey, a veteran pomologist and horticulturist of this city, writes to the *Massachusetts Ploughman* to say that he inclines to the view that drying fruits is attended with loss of valuable constituents. This led the editor of the JOURNAL to send to the *Ploughman* the following communication: —

TO THE EDITOR OF THE PLOUGHMAN: —

It affords me pleasure to present some further explanations regarding the influence of drying upon grasses, fruits, etc., especially as my esteemed and intelligent friend, Mr. C. M. Hovey, has in the last issue of the *Ploughman* requested me to do so. It is a wise provision of nature that water is so constituted physically and chemically that it is capable of holding in solution and suspension the active nutritive principles of food products, so as to part from them readily upon the application of heat. If the molecules of water which so freely and abundantly circulate through animal and plant structures could be separated from them only by difficult chemical processes, and if their separation involved the removal and loss of the active, valuable principles held in association, it is not easy to see how farm industries, or indeed any others, could exist. If the chemist could not remove the water from the samples of soils, mucks, grasses, maize, plants, etc., sent to him for analysis, by the process of evaporation at low temperature, without the escaping water carrying off nitrogen, earthy salts, etc., his labors would be beset with great difficulties. If the Vermont farmer could not remove the water from his maple sap by boiling without the sugar molecules going off with the water, he would have no sugar for his coffee or syrup for his flapjacks. If he could not dry his apples in the sun's warmth or by artificial heat without the escape of nutrient principles, dried-apple pies would never be seen upon his dinner table. If he could not dry his fresh-mown grass in the field by the aid of the warm winds and sunshine, without the loss of the sugar, starch, gum, etc., he would cease to be a farmer, and turn his attention to "something else."

The question is, What, if anything, is lost in drying fruits and forage crops? It is not surprising that an impression prevails that valuable constituents are lost in the process, as there is great diminution in bulk, a change in the condition of the substances, and the olfactory organs detect odors in the air during the exposure to heat. Water holds all the valuable elements of plants either in *solution* or *suspension*, but not in chemical combination. The molecules of starch and sugar freely move about in the water, and they all together constitute the *sap*. Now, as the water does not hold the sugar and starch particles in *combination*, but only travels along with them, *floating* them, as it were, through the orifices of vegetable tissues, it has no strong *grip* upon them whatever, and, being more volatile, it is forced to part company, and, fly away whenever vital action ceases, and heat exerts its influence.

If a pound of fresh grass or corn stalks is placed in a glass retort, and heat applied at a temperature of about 100° F., moisture arises from the mass, and if it is condensed by a refrigerating apparatus it will be found to be *pure water*, and *nothing else;* the grass will be gradually dried into hay, and in the hay will be found *all* the nutrient principles which existed in the grass. If the water which escapes from a field of mown grass, in drying in the sun, could be condensed, it would be found to be pure water, and nothing else. The carbohydrates, nitrogenous compounds, and salts existing in the grass, and held in solution and suspension in the water, have been changed in physical condition, — they have been *dried*, to use a popular term: the sugar in dilute solution has been changed into a thick syrup, or the glucose has thus been changed, and the sucrose may exist as crystallized sugar; the gum has become thickened or hard; the starch, which is insoluble, remains as it was, but entangled in the sugar and gum. There is a rich odor to grass, which is very volatile; it escapes while growing, and when the grass is cut and vitality is arrested it escapes freely. This principle is the same in nature as the odor of flowers; it is ethereal, extremely minute in quantity, and has no value whatever. It makes a great manifestation of itself on every hay field in the season, and has led many to think that it gave evidence of great loss. Such is not the case. In drying fruits the same changes occur; nothing but water escapes; the pectin, gum, sugar, remains behind. In drying, slight oxidation occurs, and the juices are thickened or hardened by the loss of water.

It is impossible to bring fruits back again into the precise condition of the green state by the addition even of the same water that is removed in the process of drying, as the solid principles become less soluble, and oxidation modifies their condition, probably.

A peck of dried peaches or a dozen oranges, to answer Mr. Hovey's question directly, are far less agreeable to the taste, far less grateful to the senses of sight, smell, and taste, but they hold all the nutriment which is found in the green condition. If we could only put back the water removed, in the *same form of association*, and replace nature's aroma or bouquet, we could have fresh fruit at all seasons of the year.

It seems to me unnecessary to further explain or discuss this matter of loss in drying forage crops, as what I have said is so direct and plain that no one can fail to understand it. In regard to the gentleman from New Jersey, whose wild misleading statements at Grafton provoked this discussion, it is enough to say that his farming is found to be no more orderly or instructive than his talk. His farm and stock are represented to be, by a delegation of visiting farmers from this State, in a sad condition of neglect and confusion, and this we should expect from the nature of his efforts at Institute meetings.

What is needed to promote true progress in agriculture is a higher education for practical farmers; an education which will enable them to contradict and overthrow the false and vulgar statements of charlatan speakers at farmers' meetings on the spot. The sooner a course of instruction in the elementary principles of science is established for practical working farmers, after the plan presented in my address at the Fair of the Essex Society in September, the better will it be for the interests of progressive husbandry in this commonwealth.

PEACH CULTURE.

THE obstacle to successful peach culture in the New England States is the disease known as the "yellows," a disease which has thus far baffled all efforts to cure. It is not confined to any one variety of the fruit, nor is it influenced by any method of soil fertilization, so far as our observation goes, and variations in seasons do not promote or retard the steady march of the disease. We have a peach orchard on a field which has had no animal manures applied to it for twenty years, and we have trees on soil-

which have received dressings of various forms of excrement, but in all instances the yellows have speedily completed their fatal work.

Noticing in the annual report of the Massachusetts Agricultural College the remark made by Professor Maynard, of the botanical department, that the peach-trees on the farm which had been attacked by the yellows were now in apparently good condition, and free from the disease, we wrote to him asking if he would give some further information upon the subject. As the remark implied that a "cure" had in some way been effected, it was very desirable to know how it had been accomplished. Professor Maynard replies as follows: —

"We have a number of peach-trees that have shown every indication of disease, and which are to-day as healthy as any trees on the place.

"In our experience we find that trees are not attacked by this disease unless the soil becomes poor or the trees are weakened by overbearing. The top generally dies while the root remains alive for one season after the top appears dead. Our treatment has been, when a tree begins to show signs of weakness or disease, to cut back severely — not only the shoots but the main branches — then apply an abundance of plant food, and especially potash; but I think potash alone will not cure the disease. I believe if a few healthy cells can be produced the tree can be renewed in perfect health.

"The manure we have used has been muriate of potash, from three to four pounds to each tree, well distributed around the tree, ground bone or superphosphate, and some organic matter if the soil is very poor. We have used in some instances, with good results, Navassa phosphates, containing a large per cent. of iron, also manure from the blacksmiths' shops, which contains much iron.

"We do not claim to have discovered a positive remedy for the disease called the yellows, nor to have proven what that disease is, but we believe that by proper treatment the peach-tree may be kept in a healthy condition for a long series of years, and produce an abundance of fruit when the buds are so matured as to withstand the cold."

If peach-trees can be restored to health after they have been attacked, it is an important item of knowledge to know how to treat them. Our orchards have not suffered from want of nutriment, and potash in various forms of combination have been applied without success. Still, in our attempts to cure we have not cut back the trees so severely as recommended by Professor Maynard. Out of two hundred trees not more than twenty remain which have sufficient vitality left to warrant experiment, but we shall adopt the course indicated, and await results.

COAL ASHES.

Inquiries are constantly made regarding the value of coal ashes as an application to soils. The ordinary ashes resulting from the combustion of anthracite coals do not differ essentially in chemical constitution as they are found in different parts of the country. There is, however, a slight variation caused in a large degree by the different methods of combustion. Coals burned in stoves in families are usually burned under conditions of slow combustion, at lower temperatures, and therefore the ashes are more valuable than those which come from furnaces and steam boilers, where the combustion is quick and intense. They contain rather more soluble constituents which are available to plants. Hard coal ashes usually afford from three to five per cent. of soluble material, and this consists of a little potash, lime, and silica, the silica predominating. There are from fifty to one hundred pounds of substances assimilable by plants in each ton of coal ashes; the remainder, nineteen hundred pounds, more or less, is practically valueless. It may, however, serve a good purpose when spread on low grounds, affording, like sand, a drier condition, and helping to warm and protect the roots of the more valuable grasses. When coal ashes can be procured convenient to a farm which has considerable low ground, it will pay for a farmer to haul and spread them, provided it is done when other work is not pressing. But it should be remembered that all slag or clinkers must be removed, as they are a great trouble on mowing lands. They never dissolve or disappear, and are more dangerous to mowing machines than rocks. It is easy, with these facts before the farmer, to judge whether he can afford to apply coal ashes to his fields or not. They should not in general be put on dry, silicious soils, as they might do positive harm, and they are not adapted to gardens where richer soil dressings are required.

THE USE OF THE FEET IN SOWING AND PLANTING.

In an entertaining and instructive paper, by Mr. Peter Henderson, who is one of the best authorities on these matters of practical agriculture and horticulture, we find some suggestions as to the great importance of "firming" the soil over seeds after sowing, especially when the earth is dry, or likely to become so. He believes that the neglect of this simple proceeding is the cause of a loss to farmers and gardeners amounting to millions every year. The mischief done, he says, is not confined to the less important garden operations, but even corn, cotton, wheat, turnips, and other important crops of the farm often fail, in hot and dry soils, by being sown without being firmed sufficiently to prevent the dry air shrivelling or drying the seeds. Of course, the use of the feet is impracticable in firming seeds on the farm, but a heavy roller, applied after sowing, is an absolute necessity under certain conditions of the soil, to insure perfect germination.

In one of Mr. Henderson's experiments, he sowed, early in July, twelve rows of sweet corn and twelve rows of beets, treading down every alternate row of each after sowing. The results are thus stated: —

In both cases, those trod in came up in four days, while those unfirmed remained twelve days before starting, and would not then have germinated had not rain fallen, for the soil was dry as dust when the seed were sown. The result was, that the seeds that had been trodden in grew freely from the start, and matured their crops to a marketable condition by fall; while the rows unfirmed did not mature, as they were not only eight days later in germinating, but the plants were also, to some extent, enfeebled by being partially dried in the loose, dry soil.

I beg to caution the inexperienced, however, by no means to tread or roll in seed if the ground is not dry. The soil may often be in a suitable condition to sow, and yet be too damp to be trodden upon or rolled. In such cases these operations may not be necessary at all, for if rainy weather ensue, the seeds will germinate of course; but if there is any likelihood of a continued drouth, the treading or rolling may be done a week or more after the seed has been sown, if there is any reason to believe that it may suffer from the dry, hot air.

He goes on to show that this firming of the soil is even more important in the case of plants than of seeds, as their rootlets are more sensitive to the influence of a dry, hot atmosphere. The practical nurseryman generally understands this, but the inexperienced amateur seldom does. Of the latter, Mr. Henderson says: —

When he receives his package of trees or plants from the nurseryman, he handles them as if they were glass, every broken twig or root calls forth a complaint, and he proceeds to plant them, gingerly straightening out each root and sifting the soil around them, but he would no more stamp down that soil than he would stamp on his mother's grave. So the plant, in nine cases out of ten, is left loose and waggling; the dry air penetrates through the soil to its roots, the winds shake it, it shrivels up and fails to grow, and then come the anathemas on the head of the unfortunate nurseryman, who is charged with selling him dead trees or plants.

THE DISEASES OF FARMERS.

The following, from the *Springfield Republican*, gives some interesting facts on this subject, and indirectly suggests how some of the causes of disease may be prevented or diminished: —

The more common diseases among farmers are: First, pulmonary affections in various forms; second, rheumatism; third, dyspepsia; fourth, fevers, especially of the typhoid type. Every possible precaution should be employed to guard against these insidious enemies. The farmer, with his active, out-door life, can digest almost anything, and often thrives on a wretched diet; but the wife and daughters, living too much in-doors, grow pale and dyspeptic on the same fare. They need to learn and practice the pedestrian habits of the women of England. It is largely because they exercise daily in the open air that the latter retain so long the bloom and vigor of youth. More out-door exercise would promote the health and prolong the lives of American women. Though dyspepsia stands third in the list of diseases among farmers, it is the first in its prevalence among their wives and daughters. In many cases farmers' wives suffer from overwork, and sometimes this is true of their children. The duties of the farmer's wife are excessive, when to the bearing and rearing of children is added general housework, including the cooking for farm laborers besides her own family, and the care of a dairy.

The location of the farmer's home is often in a low, damp, and unhealthy spot. Low ground is preferred as more accessible, more shielded from winds, nearer springs, or more convenient for digging wells. The early settlers in New England sought the hills and mountain sides to escape malaria. When that danger disappeared, the tendency of their descendants was to the valleys, and many now suffer from damp locations, near wet meadows and little above the water level, or on hard-pan, which, holding the surface water, is always wet and cold. In such cases cellars are damp and the drainage poor. It is by no means affirmed that farm-houses are more likely to be badly located than houses in our cities and villages, but in the latter there is little or no choice. Farm-houses may be, and ought to be, better located than city residences. Low sites, where the house drains are sluggish, the fogs frequent, the air stagnant, and the effluvia from the out-buildings confined, should always be avoided

Next in importance to location is cleanness in the surroundings of the farm-house.

Pulmonary affections stand first among the four most common diseases of farmers, and indeed of the community at large. Two causes are assigned for this result. One is needless exposure to cold and wet, especially wet feet, and another is bad posture. Some kinds of work, like setting out plants, spading, hoeing, mowing, and weeding, favor a cramped position, but none of them necessitate it. Indeed, one can better bear any work if he keeps his chest expanded and his lungs well inflated. He can do any kind of farm work better by bending at the hip than by curving the spine and contracting the chest. The French, Swiss, and German farm laborers are far more erect than American farmers.

FARM STATISTICS.

A RECENT Census Bulletin contains a mass of statistics as to the number, size, and tenure of farms in different sections of the country. The following summary of the more interesting facts in the document will be welcome to many of our readers: —

Illinois heads the list with 255,741 farms, and New Mexico comes last and just behind Rhode Island with 5053. Next to Illinois is Ohio with 247,189, and New York and Pennsylvania follow with 241,058 and 213,542 respectively. Indiana, Iowa, Kentucky, North Carolina, Michigan, Kansas, Wisconsin, Virginia, and Mississippi each have more than 100,000 and less than 200,000 farms; California has 35,934, Connecticut 30,598, Vermont 35,522, and the others, excepting six Southern States which have been classified in a former bulletin, have farms ranging in numbers from 92,386 to 6529. Thus California, with a total area of 158,360 square miles, has in round numbers only as many farms as the little State of Vermont with an area of 9565 square miles.

Classified according to method of tenure it appears that Illinois, the greatest farm State, has 175,497 occupied by the owners, 20,620 rented for a fixed sum, and 59,624 worked on shares. No other State, even at the South where the blacks work farms on shares, approaches this last number, and no other State has over 20,000 farms rented for cash. The landlord in the British sense must be quite a figure in Illinois; in New York and Ohio the renting of farms is much less frequent than in Illinois, where 32 per cent. of the farms are thus worked by men who do not own them. But while no other Southern State shows so many rented farms, absolutely, some of them show a much greater proportion of them. In the great State of Mississippi, for instance, which has, all told, only 100,000 farms, 44,000 are occupied by tenants; half the farms of North Carolina are so occupied. The ownership of the soil by the men who till it, prevails most universally in Maine, where only 4 per cent. of the farms are rented. In Vermont 13 per cent. are rented, in New York 16 per cent.

Passing to the classification of farms according to acreage we find that California has 2531 of 1000 acres or over, Mississippi 1833, North Carolina 1721, Virginia 1563, Louisiana 1319, Kentucky 1112. In this list Rhode Island comes last with five such farms, Utah with nine, and Vermont leads seven of the States and Territories in this respect with 97. The largest figures appear in the tables of farms of more than 100 and less than 500 acres, of which Illinois has 116,562, being the only State to go above 100,000. But while all the other States have immense numbers of small farms of from 20 to 100 acres, California has only 7300 that come within these limits, and 20,000 that range from 100 to 500 acres.

GLEANINGS.

IMPROVED GRASSES. — The *Germantown Telegraph* says: In many respects grass culture has not kept pace with improvements in other branches. We are continually getting new plants, new trees, new fruits, new vegetables, new grains, but a new grass is never thought of. We have the same orchard grass, the same red-top, the same timothy, that we had over a hundred years ago, and, so far as the drift of thought goes, we shall have the same grasses for a hundred years to come. And yet there is no reason that we can see why there should not be improved grasses as well as improvements in any other thing, and there doubtless would be if public attention was drawn to the matter as it should be.

FLAX RAISING IN THE WEST. — The cultivation of flax is getting to be an important industry in the newer portions of the Western States. It proves a good crop on new lands, and pays well, the seed being always in demand, and this adds another good feature, — quick cash returns. In addition to the seed, there is beginning to be a demand for the straw for the manufacture of twine, and it is probable that in a short time the large amount of fibre produced will all be utilized, a great saving and consequent addition to the profit of growing the crop.

The present yield in the United States is between 2,000,000 and 3,000,000 bushels of seed, and an estimate of 19,000 tons of fibre. A large portion of the latter is wasted. The demand for seed keeps up with the supply, although the latter is increasing fast.

A HINT TO EXPORTERS OF APPLES. — A writer in the London *Garden*, commenting on the inferior quality of many of the apples exported from this country, says: As an instance of the honest method of packing and shipping apples to Liverpool and its result, I am reminded of the practice of an honest grower in the town of York, State of Maine. Five years ago he sold his apples to a travelling buyer, who, it seems, sent the whole lot abroad without repacking them. The farmer selected the fruit with great care, packing it securely. Into each barrel he put a slip of paper containing his name and address, together with a request that the final purchaser who should open the barrel would write him as to the quality and condition of the fruit when found. The whole lot chanced to come into the hands of a leading merchant near Liverpool. He found the fruit in such excellent condition and so fine in every respect that he sent a letter of high commendation to the grower at once, agreeing to buy his entire apple crop directly the next year. And this he has done every year since that time, paying him good round prices for his fruit.

JERSEY MILK. — The *New York Medical Record*, in a review of the late Report of the New Jersey State Board of Health, remarks: The subject of the adulteration of Jersey milk occupies a large space in the report, and is too vast for discussion here. The New Jersey farmer has gradually grown into the accentuated consciousness that he possesses a sacred right to do two things, — water his milk, and sell his vote to the railroads. These two privileges, together with his unshaken faith in Presbyterianism, form the tripod upon which rest the State's temporal progress and spiritual well-being. New Jersey milk, if conscious, would feel an uneasy sensation of neglect if not diluted, like an infant robbed of its morning bath. The pump is more to our neighbor milkman than drink; and as long as every one cannot be a bank cashier, he will, we fear, stick to this next best source of revenue. The New Jersey Board of Health find that nearly all samples which they examined at first were watered. They have secured some temporary improvement, but only that.

Boston Journal of Chemistry.

JAS. R. NICHOLS, M. D., *Editor.*
WM. J. ROLFE, A. M., *Associate Editor*

BOSTON, JUNE 1, 1882.

THE DEATH OF GREAT MEN.

IN the last month three notable men have passed through the process called death, and have left behind their material forms, which will soon undergo chemical change and disappear, and the records of the work of their great minds, which can never perish. There is special interest in considering the demise of men who during life were lifted above the field of view in nature which is open to ordinary individuals. The great problems which pressed upon their thoughts, and which they labored unceasingly to solve, possessed an interest for them, in life, of the intensity of which few can have any knowledge. A great poet, philosopher, or mathematician, while living, breathes the same air and walks upon the same earth with common men, but in mind, in thought, he actually occupies another sphere. A man like Mr. Charles Darwin views the great universe of matter, and the evolutions and changes therein, from an exalted stand-point, and the view secured is one hidden from the comprehension of the mass of men. All men living in civilized communities wonder what comes after the phenomenon of death is passed, but those upon whom nature has bestowed extraordinary mental capacities struggle with the problem in a way, or after methods, peculiar to them. Hence, we cannot well avoid reflecting upon the possibilities of what may come within the grasp of such men when the opposite shore of the dark river is reached. Their studies here, which seemed so far-reaching to common minds, may appear to them, in the disembodied condition, as exceedingly puerile and superficial. If, as seems probable, the material body is a hindrance to the expansion of the mind, confining it within the narrow limits of the world of matter, a release must open up wonders, the extent and meaning of which human words would fail to make clear. Mr. Darwin is dead, that is, dead to the sense of sight; but his mind, which must be an imperishable principle, is not dead. It was not buried with him, was not thrust out of the universe, was not mingled with and lost in the vast ocean of molecules of matter, which he studied so attentively and understood so well.

Mr. Emerson was a philosopher, but in the field of physics he was a stranger. The acuteness and subtlety of his mind placed him high above ordinary students, and afforded him insight into the field of metaphysics, which gave him great distinction. We remember him well as he appeared in a *pulpit* about a dozen years ago. Mr. Emerson in a pulpit was like Darwin in a toy shop; the surroundings were uncongenial. He had been invited to lecture in a small village in Eastern Massachusetts, on Sunday, and there being no suitable hall, he was ushered into a church. It was rather a peculiar exercise to be conducted before a rural population with New England religious prejudices. There was no invocation, no prayer, no hymn, no *sermon*, no benediction; but there was an essay read, which

in brilliancy of thought and subtlety of analysis could hardly be surpassed. The wondering audience seemed dazed, and separated at the close of the exercises without asking any questions or making any comments.

Longfellow, the poet, whose sweet hymns and songs have delighted and cheered millions of readers in all nations and climes, was the first of the immortal trio to cross the river, but the boatmen were not far behind bringing all that could survive of the great naturalist and the great philosopher. What they may have to tell us when we who remain have crossed the river cannot be known until that event occurs.

M. PASTEUR.

It required no ordinary moral courage for M. Pasteur, the distinguished biologist and investigator in the department of germinal organisms, to announce himself a *spiritualist*, at his brilliant reception at the French Academy, April 27th. His position was perhaps as enviable as any that a scientific man can hope for, surrounded as he was by an assemblage which embraced the most learned and brilliant men of the age. It was the occasion of his introduction to the Academy, when he gave an address commemorative of M. Littré, to whose chair he succeeds.

It is not supposable that, in the use of the term, he intended to have his associates understand that he has any affiliations with the long-haired, peripatetic philosophers who exhibit as mediums in various parts of the world, but rather that he discovers in the psychical phenomena called spiritualistic the elements of fact. A more extended, careful, unbiassed study of this class of phenomena by scientific men has undoubtedly resulted in establishing in the minds of many a clear conviction of their verity; but there are few who have the courage openly to avow their beliefs.

M. Pasteur in his address encountered the sharp rebuke of his associate, M. Renan, the agnostic, and author of the "Life of Jesus." M. Renan said, "You use two words which, for my part, I never employ: I mean *spiritualism* and *materialism*. I really should not be able to say whether I am spiritualist or materialist." This remark, in connection with others more extended, was addressed directly to M. Pasteur, and excited much comment. Altogether the reception of the new incumbent of a chair in the famous French Academy was a notable occasion, and must give rise to considerable controversy.

ABOUT DARWIN.

Our foreign exchanges of late have been full of references to Darwin's life and works. We have marked many passages for quotation, but find that we have space for only one or two of them.

The following with regard to the *methods* of the eminent naturalist is as instructive as it is interesting: —

One scarcely knows which to praise most in this great biologist, his methods or his results. Down to his time naturalists had been chiefly observers and describers. Mr. Darwin was all this, but he was also an experimenter. Let us illustrate his character in these two respects. The philosopher is walking over the pretty downs near Farnham. He sees a few Scotch firs on the hill-tops; they have been there for years; but now some enclosures are made, and very shortly there spring up self-sown firs in hosts too many to live. "On looking closely between the stems of the heath," he says, "I found a multitude of seedlings and little trees which had been perpetually browsed down by the cattle. In one square yard I counted thirty-two little trees; and one of them, with twenty-six rings of growth, had, during many years, tried to raise its head and failed. No wonder that as soon as the land was enclosed it became thickly clothed with young firs. Yet the heath was extremely barren. . . . Here we see cattle absolutely determine the existence of the Scotch fir." Then there was the curious bit of connected natural history showing how the number of old maids in a village might determine the growth of the heart's-ease or the red clover. If there were many ladies with pet cats, there would be few field-mice; with few mice there would be more red clover, which requires the bees to fertilize it; "hence we may infer as highly probable that if the whole genus of humble-bees became extinct, or very rare in England, the heart's-ease and red clover would become very rare or wholly disappear." Facts like these Mr. Darwin has marshalled by the score, and, Sir John Lubbock and others following his example, are daily extending the record. They seem simple, but they are of the utmost importance, as showing the dependence of one part of the economy of nature on another. In this way a school of biologists has been formed who have explained how animals have acquired their forms and characters; how plants have gained the beauty of their forms, the gorgeousness of their colors, and the sweetness of their perfumes; and how by continued sexual selection the male animal in many species, as the male lion and the common fowl, have become strikingly handsome; whole classes of facts have received explanation which heretofore were enigmas.

Tyndall has referred to the fact that the publication of the "Origin of Species" was long delayed, and would have been postponed yet longer but for Wallace's researches in the same field. He says: —

All great things come slowly to birth. Copernicus pondered his great work for thirty-three years; Newton for nearly twenty years kept the idea of gravitation before his mind; for twenty years, also, he dwelt upon his discovery of fluxions; Darwin for two-and-twenty years pondered on the problem of the origin of species, and doubtless he would have continued to do so had he not found Wallace upon his track.

A recent writer, referring to the same matter, remarks: —

Few things in the history of science are more remarkable than the fact that on one and the same night in 1858 Mr. Alfred Wallace and Mr. Charles Darwin presented to the Linnæan Society of London papers asserting the doctrine of evolution; and nothing in its annals is more noble than the entire absence of rivalry between these two simultaneous discoverers of the greatest doctrine in natural history. "The behavior of Mr. Wallace in relation to this subject has been dignified in the highest degree," wrote Dr. Tyndall; while Mr. Darwin freely admitted the merit of Mr. Wallace's researches. This generous rivalry did good. After accumulating facts for two-and-twenty years Darwin found that he must submit to the world his theory, or he would be anticipated, and in 1859 appeared "The Origin of Species,"— a work that, as the Germans say, was *Epoch-machend* — epoch-making — that re-created natural history, that gave a new impetus and a fresh direction to research in everything relating to plant and animal life, and profoundly modified men's thoughts and beliefs. . . . It would certainly be hard to name a book that in the same short space has produced equal effects to "The Origin of Species." At first derided and treated with easy ridicule, then seriously attempted to be confuted, it has in three-and-twenty years made a mark on the intellectual world, if not, indeed, a conquest of it, which is without a parallel.

UTILIZING CIGAR ENDS.

While dining at the Ostrich (an appropriate name for a German hotel, by the by, for one needs the digestion of the long-legged bird there), in Nuremberg, a few years ago, our attention was attracted by certain curious little machines which were placed on the table at the end of the meal when the universal smoke was about to begin. They were intended to cut off neatly the pointed end of the cigar which is usually bitten off, and to save the severed bits in a locked receptacle. On inquiry we found that the tobacco thus economized was sold for the benefit of a city charity, and that the receipts were sufficient to support and educate sundry orphans.

We do not know where the idea originated, but it was a new one then. Since that time, however, it has become common in France as well as Germany, and has been extended to the saving and utilizing of both ends of the cigar. The London *Globe* gives the following account of the business as conducted in Paris, and suggests that it might be made even more profitable in the English metropolis: —

A most profitable trade has sprung up around all the places where men congregate for smoking purposes. The pieces of unconsumed tobacco leaf abandoned in the street or on the floors of smoking-rooms are sold to horticulturists, who find it quite worth while to pay a good price for them for the fumigation of greenhouses. Recent statistics show that there are some 500 individuals who are engaged in this trade, and the profits made by them are estimated at 4 fr. to 5 fr. a day. The collectors start generally at early morning, and search diligently the gutters and pavements of the chief streets and boulevards. Others have an arrangement with the waiters at hotels and clubs, and purchase from them all the cigar and cigarette ends dropped in these places of assembly. All they collect is set apart in baskets, and subjected to a process which cleans off the ashes and dust and other superfluities, and reduces the whole mass to the condition of mere tobacco. It is then weighed and sold at a price amounting to about one-fifth of the sum charged by the government for manufactured cigars and cigarettes. The result, taking it by the year, is that about 750,000 fr., or not less than £30,000 ($150,000) is made by the proceeding.

"ANN ELIZA" ON CESSPOOLS.

The *Sanitary Engineer* has a long article from "Ann Eliza" on cesspools. It is an amusing burlesque, but the following paragraphs from it will show that it not unfairly represents the average "popular" notions on the subject: —

Cesspools are made, I believe, to receive and hide from our sight everything that we want to get rid of and never see again in the way of house refuse, if it can be induced to follow a drain pipe and run thither of its own accord. They are sometimes called "save-alls," because they keep their contents for a long time without giving them air enough to permit of their going to decay, and don't allow their

solid portion to get away far beyond their walls. They are sometimes supposed to be tight, but very rarely are really so, and only bother you by getting filled up too often if they are. They generally soak off a part of their juicy contents downward through the soil till they reach some well, which is often dug in their vicinity.

It will be seen that when water is scarce in a dry time this is an extremely economical arrangement; for the water that we throw into the house drain is not lost, but has a chance to settle, and finally gets into the well to eke out its supply in a dry time, and we then have a chance to use it over and over again without paying any corporation for a new supply.

The ground through which it soaks generally filters it, so it is always clear and cool and sparkling when it comes from the well, and is therefore more agreeable to the eye than most of the muddy-looking aqueduct water that you get from rivers. It is true that the chemists try to frighten us with their long lists of figures, and spin yarns about *album ammonia* and all that nonsense; but that is natural, for they are "book men," and take naturally to albums and all that sort of æsthetic stuff. For one, I am not afraid of my well water, which our family has used for seven generations, among which I can show you bone and muscle enough to take any chemist in your city and throw him over our barnyard fence quicker than he can say "Jack Robinson."

METEOROLOGY FOR APRIL, 1882.

The sum of my observations on the weather for the past month was as follows: —

Average Thermometer.		Lowest.	Highest.	Range.
At 7 A. M.	37.07°	22°	47°	25°
At 2 P. M.	50.67°	87°	67°	30°
At 9 P. M.	42.33°	30°	54°	24°
Whole month	43.35°	22°	67°	45°
Second average[1]	43.10°			
Last 19 Aprils	43.33°	33.17° in 1874.	50.61° in 1878.	12.44°
Second Av. do.[1]	43.18°	37.53° in 1868.	50.01° in 1878.	12.48°

[1] Found by adding the average evenings *twice*.

The average barometer for the month was 29.592 inches, the lowest 29.30 on the 20th, and the highest 30.40, on the 3d, a range of 1.10. The sum of daily variations was 4.94 inches, giving an average daily movement of .165 of an inch. The average of the last ten Aprils has been 29.793, the lowest 29.592, in 1882, and the highest 29.900, in 1874, a range of .308 of an inch. The average daily movement for ten Aprils has been .174 of an inch, varying from .137 to .234.

The face of the sky, in 90 observations, gave 46 fair, 21 cloudy, 17 overcast, 4 rainy, and 2 snowy. The amount of rain and melted snow (the latter too small to measure separately) was 1.85 of an inch, while the average for the past 14 Aprils has been 4.14 inches. The lowest amount, 1.20 inches, was in 1869, and the highest, 8.50, in 1870.

The prevailing direction of the wind, as indicated by the usual observations, was west 15° 45′ north; the excess of northerly observations 9 and the westerly 32 over the southerly and easterly. The approximate average direction for the past 13 Aprils was west 39° 15′ north. In only one instance (1880) have the southerly observations exceeded the northerly, and then only by 9, while the easterly have exceeded the westerly in two instances, in 1870 by 3, and in 1877 by 41, observations.

The past month, by common consent, has been unusually cold and disagreeable. And yet the temperature, as indicated by the thermometer, has been only a trifle below the general average for the past nineteen years. About one half the month was cloudy, overcast, or stormy, but with little rain or snow. There were few warm, bright, sunny days. The first day of the month was the coldest, with an average less than 33°, and ice was formed of considerable thickness. From the 10th to the 12th, and again from the 23d to the 25th, were also cold spells, endangering fruit buds and checking the forwardness of the spring, indicated by a warm March. The 17th was the warmest day, an average of 54°. The range of the barometer was remarkably low even for April, a month ranging the lowest of any during the past ten years. This must have had its influence in depressing our spirits and increasing the general gloom.

D. W.

Natick, *May* 5, 1882.

EDITORIAL NOTES.

A Feline Test for Sewer-Gas. — An ingenious woman in Hoboken, N. J., recently invented what may perhaps prove to be an improvement on the peppermint test for leaky waste-pipes. Noticing an offensive odor in the parlor of the house which she occupied, she suspected a defect in the waste-pipes, and sent to the agent to request that a plumber might be sent to examine them. The agent assured her that the plumbing was perfect, but this did not satisfy her, and after consultation with her neighbors she procured a vial of oil of peppermint, and poured it into a washbowl in the upper story. The perfume of peppermint was soon apparent in the parlor, and the woman went again to the agent, assuring him that there must be a leak in the pipe on the first story. He was still incredulous, and to make her proofs still more convincing, she devised a new test. After borrowing two cats from her friends, she purchased some oil of valerian, and stationing the animals in the parlor, went up-stairs and poured the valerian into the basin, in the same way that the peppermint had been previously applied, and then descended to watch the result. Cats are extremely fond of the odor of valerian, and it was not long before both of them began to sniff the air, and move toward the door of a closet through which the waste-pipe ran. The door was opened for them, and they immediately sprang upon a certain shelf, where they remained, purring with satisfaction. A third time the woman went to the agent, who, though still unbelieving, consented to send a plumber to make further investigations, and on cutting away the plastering so as to expose the pipe, a joint was found completely separated at the place which the cats had indicated.

A Floating Commercial Exhibition. — The *Chemist and Druggist* reports a plan for sending a steamer round the world with samples of merchandise: "The Viceroy, a vessel of 3000 tons, has been chartered and planned out into cabin show-rooms. It is expected that she will sail from London in June for a year's cruise. The route proposed is by the Mediterranean and the Suez Canal, calling at Gibraltar, Malta, Cyprus, Alexandria, and Port Said; thence to Bombay, Ceylon, Singapore, Batavia, and to all the ports of Australia and New Zealand; and home by the South African ports and Madeira. A deck is to be fitted up as an exhibition, with 345 spaces for show-cases, which are to be charged £30 to £40 each, or a special show-room can be had for £250. A saloon passage for the salesman will cost another £250. It is not unreasonable to expect that this floating exhibition will be visited by the chief buyers of every port at which the steamer calls, so that colonial business can be pushed in the most convenient manner."

Explosion of a Gold Lion. — According to the *North China Herald*, Tso-An, the late-lamented Empress Regent of the Flowery Realm, underwent an uncommonly curious and startling experience in the pleasure-garden of the palace at Pekin a short time before her death. It appears that several huge effigies of lions adorn different parts of the private grounds allotted to the special use of the imperial family's female members. Two of these mimic lions, cast in pure gold, stood on either side of a shady path, her Majesty's favorite resort during the hour of preprandial exercise. As she was strolling up and down the walk, one fine morning last March, attended by her ladies of honor, to her surprise and consternation one of the golden lions suddenly sprang into the air from its pedestal, and, with a tremendous roar, like the report of a cannon, fell nearly at her feet, shattered to pieces. Tso-An swooned away on the spot, and was carried into the palace, where she speedily came to herself, and was found to have sustained no damage beyond a severe shock to her nerves. It was subsequently discovered that the hollow body of the lion had been filled with gunpowder, and fired by means of a wire connected with an electric battery fitted up in the private sitting-room of a subordinate palace official. This person's arrest, and the depositions afterwards obtained from him by certain ingenious methods of persuasion usually brought to bear upon criminals by the Chinese executive, led to the discovery of an elaborate court conspiracy against the life of the Empress Regent. It is, perhaps, unnecessary to add that the conspirators did not survive their accomplice's revelations for any great length of time.

To Keep Insects Quiet under the Microscope. — The vigorous movements of some insects offer a difficulty to microscopical examination and preparation. Signor Stefanelli overcomes this by applying to the insect's mouth a small drop of chloroform, which immediately renders it motionless.

ATOMS.

Doctors have a good deal to bear from anti-vaccinators, anti-vivisectionists, herbalists, and others; but the latest and worst insult comes from one of the Southern States, where a local legislator has introduced a proposal to make it obligatory to inscribe the name of the physician on the tombstones of deceased persons. — The *Moniteur des Produits Chemiques* advises melon-growers to put coffee-grounds on their melon-beds; they form a very stimulating manure, and greatly improve the flavor of the fruit. — Senator McPherson has brought a resolution before the United States Senate, which has been adopted, requesting the Secretary of the Treasury to report to the Senate all information respecting the merits of compressed-gas systems, for lighting harbors and rivers. — It is said that there are upward of 3000 steam-ploughing machines now employed in England and Scotland. — There are only six charcoal-iron furnaces in Great Britain, and they all belong to one firm; the annual yield of charcoal iron is about 3000 tons. — Pure butter at fifteen degrees has the same specific gravity as alcohol of 53.7 per cent. (.926), and oleomargarine as alcohol of 59.2 per cent., or .915 specific gravity. — Wood piled in a tank and covered with quicklime which is gradually slaked with water is said to acquire great hardness and consistency after the lime has acted upon it for a week or more. — To free maize from fat, when the grain is to be employed in the manufacture of spirits, M. C. Leew recommends that the maize be coarsely ground, and then thrown into a solution of salt having a specific gravity of 1.116, when that portion poor in fat sinks. — A rich and very extensive deposit of iron, capable of yielding as much as 70 per cent., has been discovered in Lapland. — The Municipal Council of Naples have approved a project, presented by M. Lamont, for construction of an underground railway connecting different parts of the city.

Medicine and Pharmacy.

COFFEE, MEDICINALLY AND DIETETICALLY CONSIDERED.

BY C. E. PAGE, M. D.

II.

Coffee is styled the drink, *par excellence*, of the brain-worker. Cases like the following are by no means rare: Under the influence of two or three cups of strong coffee the brain of an essayist works satisfactorily, perhaps for hours; the hands and feet meanwhile growing cold and clammy, and the entire surface "chilly," while the brain throbs with congestion, until, finally, the mind becomes confused, strange mistakes are made, words are repeated or misspelled, and although the over-stimulated but now clogged and exhausted brain can see, dimly outlined within itself, pages, whole chapters perhaps, that must be written now or be forever lost, — or at least his diseased imagination thus pictures it, — still, he finds it impossible to proceed, and with a martyr spirit, or perhaps despairingly, he ceases from his labors. If, under such circumstances, food is taken, — a full meal in response to a ravenous appetite, or a light one in spite of lack of appetite, — a night of disturbed sleep almost surely follows, and during its waking intervals the brain often does its best work, which is worse than lost, unless the sufferer rises in (what should be) "the dead hours of the night" to record his brilliant thoughts. Imperfect, however, as may be his repose, still, he may, with the aid of fresh stimulation, be enabled to take up his work again for the day. This may go on indefinitely, but with less and less satisfactory results from month to month, until, after a time, becoming alarmed, he feels the need of a long vacation. If, however, in spite of all premonitions of danger, he keeps on denying himself the "rest" he so much needs, it is like pulling a heavy load up-hill, and, a little later he finds himself utterly prostrated. Whether, now, he dies speedily of paralysis, "heart disease," or "nervous prostration;" fails gradually and dies of "consumption;" or recovers some degree of health, after a long illness, the cause of his disease is believed by himself, friends, — and physician, perhaps, — to have been "overwork." In fact, it is the effect of *stimulation* inciting to excessive brain, to the neglect of physical, exercise; the brain is clogged by its own unexcreted waste, and the entire system unbalanced and unstrung. It is in such cases that a resort to "tonic treatment," beef-tea, or a "generous diet" of flesh-food — for which, perhaps, a fictitious appetite is created by the use of "regular" or irregular bitters — often destroys the patient's last chance for recovery. It is, says Professor Brunton ("Indigestion as a Cause of Nervous Prostration," *Popular Science Monthly*, January, 1881), "piling on fuel, instead of removing ash."

Whatever degree of eminence our brain-workers may hope to attain under any form of stimulation, before their lives shall be prematurely ended, all may rest assured that by obeying the laws of life and building up a healthy body they will, in the long run, — the "run" made longer thereby, — do more and better work without than with artificial aid. The stimulus of good health is far better than that derived from any stimulating drink.

Professor Proctor, in the paper before alluded to, further says: "Notwithstanding the adoption of theine-containing beverages by mankind at large, we cannot hesitate to commend that robust habit which discards all dependence on adventitious food, even on so mild a stimulus as that of the tea-cup, and preserves through life the fresh integrity of full nervous susceptibility. And probably there was never a time when there were so many persons as now who are disposed, by conviction and by a desire for a stalwart physical independence, to refuse to fix any habit that holds the nervous system."

Dr. Segur asserts that "habitual coffee-drinkers generally enjoy good health and live to a good old age." We find, however, that a very large proportion of those coffee-drinkers who are, at the same time, observing and conscientious freely confess to the ill effects of the beverage: it makes them "nervous, irritable, or gives them headache frequently," they say; and it is quite common to hear them declare that they would leave it off if they could, but they "depend on it, — it is the principal part of breakfast." Quite a percentage of even robust people, beginning to feel, or to recognize after having long felt, the twinges of dyspepsia do, either on their own judgment or by the advice of the family physician, give up the habit, and find great benefit from the change; and but for clinging to other unnatural practices, they might often bid adieu to all their physical ills.

A few, comparatively, of the most vigorous men and women, it cannot be denied, do "enjoy good health and live to a good old age," in spite of many injurious practices, including the habitual use of the stimulant coffee. But even these have their intervals of suffering, more or less severe, — "attacks" that better habits would prevent.

It might, perhaps, in this connection, be profitable to ask, What is a "stimulant"? In reply I would say that any poisonous or unnatural substance ingested into the living body, in amount within the ability of the vital organism to *readily* expel it; or even of the most wholesome food substance in excess of the *needs* of the organism, and yet, again, not so excessive as to depress the vital forces instead of spurring them to increased efforts to thrust it out, is a stimulant. In short, anything of an injurious nature, by reason of quality, amount, or the conditions under which it is administered, may produce stimulating effects. But the inevitable "reaction" of stimulation is depression; although, from natural causes, convalescents often make sufficient progress to overwhelm, or at least obscure, the evidence of the secondary effects.

Speaking with direct reference to the effect of alkaloids in general, Professor Prescott says, "While a certain portion stimulates the nervous system, a large portion acts as a sedative, so that a difference in quantity of the potion causes a difference in kind of its effects." It should ever be borne in mind that the increased action under stimulation is simply the extra effort forced upon the vital organism to expel an intruder, — the intruder being the stimulant itself. If this be the case, it necessarily follows that stimulants deplete, and can never replenish the vital exchequer. Instances have been noted of children who were observed to be unusually active and jubilant immediately prior to an "attack" of diphtheria. In such case — and a true history of every case might establish this as the rule — the diphtheritic poison acts as a stimulant; Nature is trying to thrust it out, and all the life forces are abnormally active. We cannot know in how many instances she succeeds in these efforts, nor yet how often her defeats are due to the administration of poisons and food that for want of digestion becomes a poison, altogether so adding to the toxic condition that Nature finally ends an evil she cannot cure. After a vigorous expulsive effort, for example, the system, temporarily quiescent, — gathering fresh strength for a renewal of the conflict to dislodge the enemy, or, possibly, having already accomplished the main work, now rests in the stage preceding convalescence, — is supposed to require the aid of a stimulant, and food also must be given at frequent intervals "to prevent the patient from sinking;" but alas, this proves the weight about his neck that carries him to the bottom, — "supported" to death.

Although personally a dear lover of coffee, and, by reason of an exceptionally robust habit of body, able to indulge in its use with less apparent harm than I find, upon long and careful inquiry and observation, is the case with most people, yet, nevertheless, I stand condemned by the eulogy of Abd-el-Kadir Anasari Dgezeri Hambali, son of Mahomet: "O coffee! thou dispellest the cares of the great; thou bringest back those who wander from the paths of knowledge. Coffee is the beverage of the people of God, and the cordial of his servants who thirst for wisdom. When coffee is infused into the bowl, it exhales the *odor of musk*, and is of the *color of ink*. The truth is not known except to the wise, who drink it from the foaming coffee-cup. God has deprived fools of coffee, who, with invincible obstinacy, condemn it as injurious."

According to Professor Prescott, "the administration of theine in small portions, to animals or to man, quickens the circulation and effects some degree of mental exhilaration and wakefulness. In final result, the excretion of carbonic-acid gas is diminished, and the flow of blood through the capillaries is retarded" (amply accounting for the "lessened waste of tissue"). "Larger portions," he continues, "prove poisonous, causing painful restlessness, rigidity of the muscles, and general exhaustion. Not more than three or four grains at once can be properly taken for medicinal or experimental purposes." As often prepared for old coffee-tipplers, two cupfuls (about 16 oz.) of the infusion will contain this quantity of the alkaloid. As usually taken, of course, the proportion of the alkaloid is much less. In conclusion, I would repeat that it may with propriety be claimed for coffee that its administration as a medicine is as legitimate as that of any other; but, in my opinion its daily use as an article of diet is as inconsistent and contrary to reason, as the similar use of any drug in the materia medica.

DIPHTHERIA.

Dr. Franklin Staples, of Winona, Minn., after an extended correspondence with physicians in most of the counties of his State, has made a report to the State Board of Health on diphtheria, in which he classes the disease as contagious and infectious, and demonstrates that it is on the increase, — a fact due, in his opinion, to failure on the part of physicians in recognizing its self-propagating properties; to want of systematic nursing of patients suffering from the disease; to incomplete disinfection of premises attacked; and last, but not least, to the frequent intercourse of convalescents with healthy persons. He maintains that strict regulations, rigidly enforced, are the only means adequate to cut short its career, and, since individual power is unable to cope with it, he urges that every city and town should devise efficient sanitary laws, and let them be enforced by intelligent medical officers, who should also make it their duty to instruct the people in sanitary rules. To guard against contamination, he believes that filth, whether from dirty rooms, soiled clothing, defective drains and cesspools, ill-ventilated rooms, poisonous inodorous gases, etc., should be regarded as conditions which invite the disease; that the apartments set apart for the patient should be divested of all furniture, carpets, curtains, and fabrics of any kind not absolutely required; that discharges from the nose, mouth, and bowels should be carefully collected and destroyed; and that all personal clothing, bed-linen, etc., should be thoroughly disinfected before being sent to the general wash. In case

of death, all clothing and unimportant articles should be burnt, the body should be immediately disinfected and put into its coffin, which should be kept permanently closed. There should be no public funeral. He prefers disinfection by chlorine gas, which is to be set free in the room. Ventilation for a number of hours should then be insisted upon. Precautions falling short of these he considers to be useless in preventing the spread of the infection.

EMULSION OF COD-LIVER OIL, ETC.

In a paper in the *Louisville Medical News*, Professor Diehl calls the attention of practitioners to the desirableness of preparing their own emulsions. Those prepared by manufacturers soon undergo change and become unfit for use. By following the rules which he lays down, he says, the practitioner may always be in possession of a fresh and reliable article. These rules are as follows: —

(1.) That the water and gum arabic shall be in definite and absolute proportions to each other. This proportion is three parts of water to two of gum, both by weight. (2.) That the relation of oil to gum and water shall be definite within certain limits — that is to say, the mucilage formed in the above proportions is capable of perfectly emulsifying a minimum and a maximum proportion of oil. The minimum is two parts of oil to one of gum; the maximum is four parts of oil to one of gum. (3.) That the trituration of the oil, gum, and water be continued until a perfectly homogeneous, milky-white, thick-creamy mixture is formed — *i. e.*, until perfect emulsification takes place — before the addition of a further portion of water or other liquid. The thick-creamy emulsion so obtained must be the basis of all perfect emulsions. It will bear dilution to any extent, forming mixtures varying, according to the proportion added, from the appearance and consistence of cream to that of very thin milk. Obviously, for water may be substituted solutions of saline compounds, syrups, etc.; and this enables the production of the various combinations of cod-liver oil in current use from the above thick-creamy emulsion, which, for distinction, I shall designate — (1.) *Concentrated Emulsion of Cod-Liver Oil.* — Take of fresh cod-liver oil eight, powdered gum arabic two, and distilled water three ounces troy. First weigh the gum into a wedgwood or porcelain mortar, then the oil, and triturate until the gum is well mixed with the oil. Then weigh into the mixture the distilled water, and triturate the whole briskly until the mixture thickens and acquires a pasty consistence and milky whiteness. Scrape down the portions adhering to the sides of the mortar and to the pestle, and continue the trituration for a short time, after which add such other ingredients as may be desirable, or transfer the concentrated emulsion to a wide-mouthed bottle for future use. This concentrated emulsion will keep for a reasonable time in cold weather, and if put into the ice-chest also during summer; but as its preparation does not take more than five or ten minutes, never more than a week's supply should be made. (2.) *Simple Emulsion of Cod-Liver Oil.* — Take of the concentrated emulsion thirteen ounces troy, oil of wintergreen twenty-six drops, syrup one fluid ounce, and water three fluid ounces. Weigh the concentrated emulsion into a mortar, add the oil of wintergreen, and triturate thoroughly. Then gradually add first the water and then the syrup. The manipulation of this emulsion is typical for all other cod-liver emulsions. It has the consistence of very thick cream, but is readily poured out of narrow-mouthed bottles, is milky-white, and mixes readily with water or other liquids that may be administered with it. It contains exactly fifty per cent. (by volume) of oil. The oil of wintergreen disguises the taste of the oil very admirably, and has the further advantage that it acts as a preservative.

The same method may be used with other oils, and the following emulsion of *castor oil* may be quoted as an illustration: —

Take of castor oil four ounces troy, powdered gum arabic one ounce troy; distilled water one ounce and a half troy; syrup, cinnamon-water, each three fluid ounces; spirit of cinnamon twelve minims. Emulsify the oil with the gum and water, as directed under No. 1, and then add the other ingredients successively with constant trituration. This emulsion contains thirty-three per cent. of castor oil, and is consequently more limpid than the fifty per cent. cod-liver oil emulsion, and in every respect is an elegant preparation.

MISCELLANEA MEDICA.

A Simple Means of Detecting Trichinæ. — According to Professor Phin, the parts of an animal that should first be examined are the diaphragm, tenderloin, and muscles about the head and throat. In a ham, the most likely place is that part at which the muscle ends in a tendon. Cut off a thin slice with a very sharp knife, or with a pair of scissors curved on the flat. This thin section should then be soaked for some minutes in acetic acid, spread out on a thin piece of glass, and covered with another similar piece. These two slips are then pressed together. A compressorium, by means of which the plates of glass are forced together by a lever and screw, answers admirably. But better still he finds the trichinoscope, which is a compressorium holding the two glass slips, but fitted with a simple microscope on a sliding frame, which permits the examination of the specimen in each part. A thin piece of flesh, moistened with a mixture of equal parts of acetic acid and glycerine, is placed on the lower plate, and spread by means of needles fixed in wooden handles. The upper plate is then brought down on the lower one, and the screw is turned into the slot in which it fits. By turning the nut any degree of pressure may be brought to bear on the flesh, which thus is rendered so thin and transparent that any trichinæ present will be readily brought into view.

Charcoal in Infantile Diarrhœa. — M. Jules Guérin recommends charcoal in the treatment of infantile diarrhœa. The affinity, he says, he sought to establish between the choleriform diarrhœa of children and adults, led him to apply to the children the same treatment he had used so successfully with adults. M. Guérin orders the charcoal (wood) to be put into the feeding bottle (half a teaspoonful suffices at the time), and, where the child takes the breast, in a little sweetened milk; a teaspoonful to be given frequently during the day. After the first day the evacuations change in consistence and odor; from green they become a blackish-yellow. From this treatment M. Guérin has seen children who were wasted by seven or eight days' obstinate diarrhœa recover their usual healthy expression in three days.

Autographic Men. — Chomel reports a class of human beings whom he calls "autographic men," who, from certain central neuroses, present a form of urticaria, which shows itself when a slight irritation is applied to the skin. The cuticle may be written on and retain the character inscribed on it for some time, through the urticaria so produced. Dujardin-Beaumetz was the first to describe this phenomenon, which is by no means rarely observed.

Soda for Burns. — Dr. Troitsky has used bicarbonate of soda exclusively in twenty-five cases of burns, with the best results. He either sprinkles the burns with dry soda (baking soda), or covers it with a compress saturated in its solution. When the compresses get dry, more of the solution may be poured over them, without removing them, unless the exudation of pus renders it desirable to cleanse the wound. The beneficial effect of soda is accounted for on three grounds: it acts as an anæsthetic, an antiseptic, and a disinfectant.

Commercial Malt Extracts. — Dr. William Roberts, in the *British Medical Journal*, says: "If properly prepared, malt extracts are rich in diastase, and have a high power in digesting starchy matters. But you will be surprised, as I was, to learn, that a large proportion of the malt extracts of commerce have no action on starch. This is owing to a high temperature having been used in their preparation. Any heat above 150° Fahr. is destructive to diastase in solution; so that if the extract be evaporated, as is directed by the German Pharmacopœia, at a temperature of 212° Fahr., it is necessarily inert on starch. Out of fourteen trade samples of malt extract examined by Messrs. Dunston & Dimmock, *only three* possessed the power of acting on starch."

Reported Failure of Artificial Quinine. — Dr. A. Schapringer, of the Jewish Hospital, Philadelphia, reports that he has tried chinoline tartrate (described in our March number) with poor results. In several cases in which patients failed to be cured under its action, they were subsequently cured by the use of quinine sulphate in greatly reduced doses. Dr. Cohen's experience was alike unsatisfactory; nevertheless, the remedy deserves further trial.

Decay of the Teeth. — The acids which cause the decay of the teeth are conveyed in the secretions of the gums and the mucous membranes of the lips and cheeks, and the usual points of attack are in the interstices and the grooves in the facial walls of the teeth. The calculary nature of the saliva is antagonistic to the acids, and preserves the teeth from their dilapidating influence. Teeth are protected from disease by the following conditions: Their regular shape and order, that the situations for the deposit of acids be as few as possible; the conservation of the teeth from noxious influences by constant brushing; the healthy structure of the tooth itself, and of the mouth generally. Heider observes that the yellowish white teeth are less subject to the attacks of caries than those of a bluish shade, the enamel of the former being much harder, and the molars have been found to contain more mineral substance than the incisors.

Obesity in a Child. — Dr. Hillairet exhibited in Paris, not long ago, a girl, five years old, who weighed one hundred and twenty-four pounds, and measured four feet round the waist. The child was healthy in other respects, but somewhat scant of breath.

A Victim of the Anti-Vaccination Craze. — The following item in regard to Samuel Piercy, the actor, who died of small-pox in Boston a short time ago, is copied from the New York correspondence of the *Philadelphia Press*: "He was one of a half-dozen intelligent men I ever knew to be influenced by the crazy howls of the anti-vaccination fanatics. Jebb and Bergh and the rest of the mistaken lot had managed to convince him that the risks lurking in the preventive were worse than the dangers of the disease. Before leaving New York, a few weeks ago, he laughingly rejected the advice of friends who urged him to be vaccinated. He was a convert to the views of Jebb and Bergh, and he paid the penalty of martyrdom."

SELECT FORMULÆ.

Artificial Hunyadi Janos Water. — The following formula is recommended as a cheap and efficient substitute for this purgative water. It is thrice the strength of the formula derived from Pro-

fessor Liebig's analysis of the natural water, the latter being found wanting in purgative action: —

Sulphate of magnesium, 514.92 gr.; sulphate of sodium, 519.54 gr.; sulphate of potassium, 2.76 gr.; chloride of sodium, 39.15 gr.; bicarbonate of sodium, 15.60 gr.; water, 16 oz. Dose, two ounces and upwards. It will be observed that the chloride of calcium is omitted, but the proportion is so small that, even when it was included, there was no difference in the action.

This is said to be equal, in every respect to the original, and costs about two cents per quart.

FLUID EXTRACT OF TEA. — According to Mr. R. F. Fairthorne, in the *Journal of Pharmacy*, the following extract of tea has been found superior to both coca and guarana for the relief of headache: —

Best imperial tea	32 troy oz.
Glycerine	8 fl. oz.
Water	8 fl. oz.
Alcohol	16 fl. oz.
Diluted alcohol	q. s.

To the tea, in fine powder, add sufficient of the mixture of the liquids to moisten it, and pack it in a percolator; pour in the remainder of the menstruum, and let it stand 4 days. Then continue the percolation, using diluted alcohol until 24 fl. oz. have been received. Remove the mass from the percolator, and add to it 1 gallon of boiling water. After macerating 24 hours, express, filter, and evaporate to 8 fl. oz.; mix with the percolate, and filter.

CORN CURES. — Dissolve 1 part of salicylic acid in 40 parts of collodium; apply several times a week. The corn dissolves with little trouble. For hard corns, apply at night a mixture of 1 part of carbolic acid, and 10 parts each of distilled water, glycerine, and soap liniment. Envelop with gutta-percha tissue, and the corn may generally be removed the next morning. For inflamed and swollen joints, proceed in the same manner, but use, instead of the above mixture, liq. plumbi dil., 100 parts, and tinct. croci, 5 parts.

EXTRACT OF HERBS FOR FLAVORING SOUPS, ETC. — The *Journal of Pharmacy* gives this formula: —

Savory, sweet marjoram, and basil, of each	2 oz. (troy).
Sage and black pepper, of each	½ " "
Thyme	1 " "
Celery seed	1½ drachms.
Alcohol	8½ pints.
Water	½ pint.

The ingredients are reduced to coarse powder, packed in a percolator, and 4 pints of extract obtained by percolation, the last being displaced by diluted spirit. This is recommended to add to beef tea to make it less insipid.

ANOTHER REMEDY FOR BURNS. — Dr. H. Neeson, of Louisiana, sends us the following remedy, which he has employed with great success in burns and scalds: —

Castor oil	℥iv.
Gum camphor	℥i.
Hydrate chloral	℥i.

Mix well in a mortar and apply with a feather or brush; and repeat as often as may be necessary to relieve pain, covering the burnt surface with cotton lint. As rapidly as the oil is absorbed and burnt up by the heat of the body apply narrow strips of adhesive (isinglass) plaster, allowing the edges to come as near together as possible without preventing free egress of pus and serum.

SODA-FOUNTAIN RECIPES.

Now that the soda-water season has come round again, the following recipes from the *Druggist's Circular* will be of interest to our pharmaceutical readers: —

Syrup of Coffee.

Take one pound of fresh roasted Java or Mocha coffee and percolate according to the directions of the Pharmacopœia with the following mixture: —

Alcohol	8 ounces.
Glycerine	4 "
Water	4 "

Then continue the percolation with diluted alcohol until fourteen ounces have passed. Set this aside, and continue the percolation until the coffee is exhausted. Evaporate to two ounces, and mix with the fourteen ounces reserve.

Syrup of Chocolate.

Take one pound of fresh roasted cocoa freed by expression from the oil (Baker's is the kind I use), and proceed in the same manner as for coffee syrup. From one half to one ounce of these extracts will be found sufficient for one pint of syrup. If there should be any objection to the preparation containing alcohol mix the extract with three times the quantity of syrup, warm slightly to drive off the alcohol, and mix with the remainder of the syrup.

Foam for Soda-Water Syrups.

Quillaya bark	4 ounces.
Percolate with a mixture of Alcohol	4 "
Glycerine	4 "
Water	8 "

And make one pint of tincture. From two to five drachms of this tincture to every gallon of syrup will be found sufficient to give every glass of soda drawn that creamy appearance so universally liked. At the same time it has the advantage of being cheap, is used in such minute quantities that it cannot be discovered by taste, is always ready for use, and will never spoil.

FACETIÆ.

THE ARCHÆOLOGISTS AND THE PIE. — A society of archæologists recently held a meeting. At the dinner a large fruit pie was produced "What is it made of?" asked a visitor. "Blackberries, sir," said the first waiter. "Blueberries," said the second. "Whinberries," said the pretty maid. "Bilberries," said Professor Babington. "Whortleberries," said another botanist. "Huckleberries," said another. The first waiter, in despair, came to the most learned-looking of the guests, and said, "Sir, they say you are a good herbalist; what is the correct name of these berries?" "VACCINIUM MYRTILLUS," was the answer. Thereafter the waiter persisted in calling bilberry tart "*vaccination murderers.*"

A NARROW-MINDED PHYSICIAN. — Dr. Oliver Wendell Holmes says: "I have known a practitioner — perhaps more than one — who was as much under the dominant influence of the last article he had read in his favorite medical journal as a milliner under the sway of the last fashion-plate. The difference between green and seasoned knowledge is very great, and such practitioners never hold long enough to any of their knowledge to have it get seasoned."

AN ANCIENT LIVER RENOVATOR. — Papa: "That picture shows the story of Prometheus, and the vulture that fed on his liver. Every day the vulture devoured it, and every night it grew for him to eat it again." Sympathetic child: "Poor, dear old vulture! How sick he must have been of liver every day!"

INDICATIONS FOR THE USE OF THE BATH. — "I think a bath daily would be beneficial in your case," said a physician to a patient. "Well, I don't know, doctor," he feebly replied. "I took a bath once, a year or two ago; I felt better for a while, but it was n't long before I was just as bad as ever, and I have been growing worse ever since." This is almost equal to the French medical writer, who objected to bathing, because it removed the natural secretions of the skin.

Boston Journal of Chemistry.

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Special Notices.

The Massachusetts State Pharmaceutical Association.

A convention of the druggists and apothecaries of this State met at Worcester on Wednesday, May 17th, and formed an association called the Massachusetts State Pharmaceutical Association. Over two hundred of the trade were present at the meeting, and the proceedings were very interesting. A constitution and by-laws were adopted, after a full discussion, and officers chosen for the ensuing year. Telegrams and communications were received from similar societies of other States congratulatory on the auspicious commencement of the association. The best of feeling prevailed, and the convention was unanimously pronounced a success, and the only wonder seemed to be that the formation of an institution of this kind had not been commenced sooner. Mr. S. A. D. Sheppard, of Boston, was chosen President, with other able officers, who will no doubt successfully carry out its objects. An association of this kind is much needed, and we wish it all success.

GOOD WORDS FOR ADVERTISERS.

LAWN MOWERS will soon be in demand, and we offer to our readers in our advertising department, on page 1, an instrument which covers the *ground* for a reliable and useful one.

THE advertisement of Colden's Beef still continues on page 8, and no doubt will be found useful to all those who need at this season of the year some reliable tonic and nutritive.

STRAIGHT to the point — like Esterbrook's Bank, Easy Writer, and other well-known standard pens. All the stationers have them.

WE welcome to our columns again the advertisement of the Bradford Academy. This institution is too well established to need only a passing notice from us; as the name of those who have derived benefits from its courses of study is "*Legion.*"

MR. J. C. RICHARDSON.

Dear Sir: I have used your Celerina in my practice, and find it to be an excellent nerve tonic. C. W. NULL, M. D.,
Prof. Physiology in Louisville Medical College, and Jefferson School of Medicine.

EVERY disease to which woman is liable can be relieved by Healey's Tonic Pills or Cordial. See advertisement on page 4.

CEPHALINE will cure Epilepsy. Read advertisement in another column.

GOOD WORDS FROM SUBSCRIBERS.

OXFORD, GEORGIA, *Dec.* 17, 1881.

TO THE JOURNAL OF CHEMISTRY:

I am an old patron of the JOURNAL and cannot readily consent to have our pleasant intercourse interrupted. It is always a welcome visitor at my study table; and its great variety of contents and interesting themes for thought; its accurate chemical details; its many useful laboratory hints; the familiarity which it indicates of a thorough acquaintance with the play of chemical affinities so desirable to the medical profession, especially in the department of Pharmacy, as well to the analytical chemist, all seem to commend it to my consideration, and I therefore thus practically express my desire that our acquaintance shall continue.

Very respectfully, and truly yours, A. MEANS.

GALVESTON, TEXAS, *March* 25, 1882.

Your paper has given me so much valuable information that it has become a household necessity to myself and family.

Respectfully, etc., N. B. YARD.

Boston Journal of Chemistry
AND
POPULAR SCIENCE REVIEW.

VOLUME XVI. BOSTON, JULY, 1882. NUMBER 7.

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Familiar Science.

FROM WHENCE?

HUMAN beings find themselves existing upon a small planetary body whirling through space, but from whence they came is a baffling mystery. Save in the Hebrew chronicles, no book, however ancient, affords any account of the genesis of man worthy of the least consideration; and no tracings on rocks or metals, no inscriptions or picturings in any part of the world, furnish any clue to the solution of the dark problem of the origin of the race. Those strange visitors from the celestial spaces, the meteorites, which are projected glowing with heat upon the crust of the earth, can give as ready answers to our questionings as the most learned of philosophers. Like ourselves, they come out of the unknown, and in studying their possible history we experience emotions akin to those which result from the study of the history of our own origin.

Leaving the matter of the Mosaic account of the origin of the race for consideration at a point further on, it remains for us to inquire what science has accomplished in its researches upon the great problem. In no department of human inquiry has a larger amount of labor been expended or more exalted talents enlisted; and the outcome, although unsatisfactory, is very interesting. It cannot reasonably be questioned that man has been a resident upon the earth for an immense period of time; a range of centuries, perhaps, which carries us back to geologic periods far remote. The evidence that he lived in Switzerland in the neolithic age is quite conclusive; and the clothes and polished stones and household objects found in the lake dwellings show that he was considerably advanced in civilization and in a knowledge of the ruder arts in that early epoch. He cultivated wheat and barley, and made bread; and, what is very remarkable, he evinced a taste for the flavoring aromatics by putting caraway seeds in his bread. He kept domestic animals, — cows and pigs, sheep and goats, — and lived, probably, somewhat as many of the inhabitants of Ireland live to-day. Several kinds of horses existed in the neolithic period, all small in stature, and there were two breeds of oxen, also small. The sheep had horns, and the goats carried immense protuberances of this nature upon their heads. The men varied from four to five feet in height, and their faces were oval, with probably not unpleasant expressions of countenance. They were like the inhabitants of Great Britain, France, and Germany, in the neolithic age, rather weak and inoffensive, not specially prone to war, but living under circumstances which afforded the highest protection from the rapacity of neighbors. These interesting facts are learned from researches made in connection with the lake dwellings of Switzerland, and as they are sustained by the most indubitable testimony must be admitted as facts. But it is highly probable that the genesis of man extends to an age much more remote than the neolithic. As we recede, however, into the darkness of early geologic times, all traces of him are lost, and although the fossil remains of strange reptiles and animals are plentiful, fossil man is missing. No coal seams, or strata of ancient sandstone, reveal in hardened lines his noble, upright form.

Nothing whatever is known of the *time* of man's advent. We may speculate and pile hypothesis upon hypothesis, but we are not thereby introduced to any clearer light. The researches of archæologists, ethnologists, geologists, biologists, have been well-nigh exhaustive, and, unless some new discoveries are made, barriers to further knowledge have been reached. If the advent of man was sudden, and he came perfected in physical form, he is certainly not contemporary with the higher forms of other animals; and the break in the chain of animal life which connects the earlier with the later geologic periods, in which man fails to appear, is not confined to the space covered by a single link. He has left no traces of his presence beyond a period which, in contrast with the length of geological epochs, is indeed recent. If he has been evolved slowly from lower forms, we still have no traces of him in any of the stages of partial development. There is, however, a strong and significant array of analogies, correspondences, and facts which give force to the views of the evolutionists, and these are worthy of consideration.

The word *evolution* means the birth or derivation of beings from others through the action of natural laws; it does not mean that man is evolved directly from an ape, and the ape, in turn, from a dog or cat, but that in nature there is a law by the action of which the lower forms of organic life and inorganic substances are slowly changed, until through endless modifications the highest types result. This law of evolution reaches and controls every department of nature, and to its dominating influence we are indebted for moral and intellectual as well as for physical qualities. It is evident that there is in nature a constantly recurring relationship among all creatures, and that in heredity we have absolute proof of the fact that like tends to produce like under all circumstances. It is due to two causes that variations occur: one is the law of heredity; the other, the surrounding influences, or the sum of the physical influences upon the organism. The first tends to preserve uniformity; the second modifies the action of the first. Very much importance is attached to what is regarded as a newly discovered or recognized law, — that of natural selection. This law asserts that some individuals are stronger or better fitted to compete with others in the struggle of life than are others of the same species; hence, they will live and perpetuate their kind, while others die out. No one has successfully combated this plain, palpable provision of nature, or can deny its great influence in elevating animal existences upon our planet.

If the doctrines of evolution and natural selection be accepted, we still wander in darkness as regards the origin of life. If these are based upon fundamental laws, it is clear that a law has not yet been found which accounts for the beginning of organic life, or which explains how dead matter became endowed with vital activities. No law has been found which accounts for the *origin* of the variation in species. When we attempt to span the enormous epochs of time which it is conceded must elapse in bringing man up from the lowest organic forms to his present exalted condition, a sense of dissatisfaction is experienced, not only because of the difficulties which beset the way, but because in all our anxious gropings we cannot find the starting-point. One end of the chain we see, but the other end is hidden in thick darkness. If we only knew how ascidian or still lower forms were evolved from dead rocks, there would be some light thrown upon the foggy end of the chain. Life can only evolve life; a rock cannot evolve an egg, or supply warmth to hatch it when evolved from life sources. It is possible for man to bring together in accurate measure the chemical constituents of an egg, but by no possibility can he supply the mysterious principle of life, or bring life out of his mixture, although he may comply most carefully with all the known conditions under which life is apparently produced. In no way is it possible for one to escape from the con-

viction that the chasm which separates the organic from the inorganic, life from death, is a broad one, and no research has penetrated or crossed the rayless gulf. Compared with the difficulties in assuming that life is spontaneous, a natural result of the continuity and coöperation of natural energies, the evolution of man from primal forms is easy of belief. The views so clearly presented by the late Mr. Darwin to the world are not to be controverted by ignorant prejudice, or demolished by exhibitions of passion or conceit. He was unquestionably one of the most learned and remarkable men who have lived in any age of the world. His views are not accepted by all naturalists, and if they were it would not remove them from the field of hypothesis to that of fact. The impatience of many, when his views of the origin of man are advocated, savors more of the dogmatism of interested belief than of the judicial earnestness and fairness which result from careful and competent investigation. The Darwinian hypothesis is so very easy of application, and so in accord with the wishes of many investigators in science, that it is too readily adopted, often without the preliminary caution of rigid analysis of the facts.

The great mind of Darwin, while these pages were in preparation, was freed from its material environments, and passed under the new conditions of existence which await all other minds. His mental nature, subjected to the highest culture and the most exacting discipline, enabled him to see clearly many of the intricacies and laws of the universe which are hidden to others. It is probable that the entanglement of gross matter with the spiritual man was far less obstructing and obscuring in his case than in that of most others, for greatness to a large extent consists in the facility with which thought rises independent of its low environment, and frees itself from its control. Under the new conditions of life to which he has passed, it is more than probable that the baffling problems which occupied his mind here are now very clearly comprehended. He has not gone outside of the great universe, for no outside is possible; he has not been released into a realm of endless night, for light and life are everywhere; he was not buried forever with the separating atoms and molecules of the body, for mind, like matter and energy, is imperishable.

After a careful study of the views of evolutionists, and a full recognition of the force of the ingenious and wonderful array of facts and theories, we are forced to come back to the more reasonable ground that man has two natures, clearly defined, and both tending towards distinct ends, — one perishable, the other imperishable. There are not insuperable difficulties in the way of understanding how man might be evolved physically from lower forms, but no stretch of the powers of comprehension enables one to conceive of the evolution of *mind* from primitive forms, and there is no chain of facts which lend reasonable coloring to such a belief.

Mind has come up apparently from a very low condition, — how low we do not know; but this is certain: the mind of man, so far as any traces of its action are discernible, has always exhibited enormous superiority over that of the highest of the animal races. There is, in fact, so far as our powers of analysis guide us, no close analogy existing between the mind of man and the instinct of animals: their mental capacities are limited; man's, in finite matters, has no limit. The mind of man is the great overpowering force in the world, a principle dominating everything. No form of energy acting under law has escaped its control, no physical forces have become its master; they all combined bow to its behests and become its servants. It must be a supernatural principle, a distinct creation, a divine essence, a mighty force, standing apart, and designed to stand apart, from all the other forces of nature.

Mind in its almost supreme control over matter meets with barriers when it essays to perform creative acts. It has succeeded in evolving out of passive forms of matter energies which are destructive and appalling; it has changed the gentle warmth of our firesides into forms of electrical force, capable of moving ponderous machinery, and it has given it wings and endowed it with mute intelligence, so that it conveys messages of instruction, congratulation, warning, joy, and love with a rapidity which practically annihilates time and space. Out of the common sand of the sea-shore it has constructed prisms and lenses as clear and beautiful as nature's proudest gems, and so arranged them in tubes of metal that the heavenly bodies are brought as it were into the laboratory for analysis, and the minutest forms of life hidden in the earth and air are revealed to the eye as distinctly as those of the larger animals. It has separated water and solids into gaseous conditions, and mingled them with the winds; has isolated and recombined rays of light so as to form the most gorgeous pictures; has forced the sun to serve as artist, and paint portraits and landscapes; has extracted from the filthy residuum of the gas manufacturer colors more beautiful than those of the rainbow; has synthetically combined molecules of inert matter so as to represent organic products of the highest complexity. All this and much more has mind accomplished, but it has never been able to create a new element or add a single atom of matter to the primitive mass of earth and air.

Whenever man has experimented with the view of so arranging matter as to evolve from it life, signal failure has attended his labors. The belief which at one time prevailed, that from liquids and sterile infusions, placed under favoring conditions, life is spontaneously produced, has now few supporters among men of research. Dr. Bastian, who experimented over a period of many years, and who persistently maintained that from his infusions bacteria and other forms of life were spontaneously produced, has been confronted with the careful and protracted researches of Tyndall and Pasteur, and his alleged successful results have been disproved. Tyndall, to escape from the germ-charged air of cities and populous districts, fled to Switzerland, and on the highest mountain peaks conducted his experiments. The results conclusively proved that the development of life in Bastian's infusions came from germinal nuclei in the atmosphere, as absolutely sterile liquids exposed to the pure air of high altitudes remained sterile under the most favoring conditions. Pasteur confirmed Tyndall's results by a long series of careful and trustworthy experiments. Man is thus shown to possess wonderful capabilities in controlling and changing matter, but the power of *creating* is a prerogative withheld from him. His agency in reproduction is no more direct or exalted than that of the lower animals and reptiles. The reproductive instinct is given not only to all living forms of animals and insects, but to plants as well. Its exercise requires no training of the intellect, no elevation of the moral faculties; savage man was as capable of covering the earth with a race of men ignorant and debased, as is the most civilized and cultivated people with one elevated to a higher plane. Modify or remove the overmastering reproductive instinct in animal and vegetable organisms, and all forms of life would at once cease. It is the strong chain which binds the animate to the inanimate, — a chain whose links are of steel, which no power short of the Infinite can break.

Research has shown the embryotic changes resulting in the development of man to be in no regard dissimilar to those which result in introducing into the breathing world the lower types of mammals. He is born helpless and absolutely dependent upon those through whose natural agency the spark of life was engendered; and like all animals is indebted for his preservation to the overpowering maternal instinct bestowed through a wise controlling power higher than that of man. Every stage of man's progress towards full development from the microscopical cells of the latent germ is marked by a superintending agency which must be divine. It cannot be denied that it is all accomplished under law, but the laws themselves are miracles of wisdom — a wisdom not born of earth.

Science does not concern itself with the statements regarding the genesis of man as found in the sacred books of ancient tribes and nations, only so far as to subject them to the most rigid rules of historical, archæological, and biological criticism, with the view of ascertaining what plausible grounds they have to rest upon. The ancient Hebrews have preserved records in which is found a circumstantial account or history of man's advent, and the world has for nearly twenty centuries been largely influenced by a belief in this remarkable narrative. Whether this be regarded as a legend of very early times, a story characteristic of the East, or as a supernatural revelation of man's genesis, the student or investigator cannot but view it as striking and extraordinary. If we are required to accept it after ecclesiastic or scholastic interpretations, which place the occurrences about six thousand years ago, and which insists upon a literal rendering of the text, the way is beset with difficulties. If, on the other hand, the narrative be regarded as a dim shadowing forth of the outlines of a creative act, instituted by divine interference in some early epoch of the world's history, it at once commands the respect of those who recognize the existence of a Supreme Creator in the universe.

There is in the narrative certain internal evidence, which, independent of all other considerations, lends to it a startling significancy, and arrests the attention at once. The prominent incidents of the transaction so briefly presented are wonderfully in accordance with possibilities, or, there is evidence of a wise adaptation of means to ends. We are told without any show of hesitancy that man was made out of the "dust of the earth;" that is, he came from the same general mother or source as all organic life. If the statement were that he was

formed out of the rocks, or out of the trees of the garden, it would be far less significant of his true chemical constitution as made known through modern research. Rocks and trees are not so constituted as to meet fully the necessities of his material organization, and the same may be said of quite all the substances or prominent objects which were open to observation in early times. In the "dust of the earth" we have an expression which may fairly be interpreted to mean the *soil* of the earth, which includes both the organic and inorganic constituents found in the physical organization of man. In this material we have the lime, potash, soda, magnesia, iron, phosphorus, indeed quite all the chemical bodies essential to man's organism. In the humus of the soil we have the materials needed for the formation of living tissues, the carbon, hydrogen, and nitrogen. The source from which man is stated to have been derived is seen to have been fully capable of supplying every needed element without the interposition of a miracle to summon the rarer molecules from afar. A human narrator of such a stupendous transaction would hardly have allowed his excited imagination to go no further than common dust for his man-material; he would have selected the clear air about him, the chemical nature of which was to him a mystery, or he would have interwoven the rainbow or the gorgeous hues of the setting sun into the noble form of man.

After the completion of the physical structure, a still more important act remained to be accomplished, and that was the endowment of life. The narrative proceeds to say that "God breathed" into the figure of man "the breath of life." This language and statement is still more remarkable than that relating to the formation of the body. From what we know of the mind or soul of man, we cannot give it a lower place than is assigned in the narrative; it must be the "breath," or an emanation from the Creator; it must be the closest, most distinctive representation of the Supreme Intelligence of all principles in the universe. It is infinitely higher than matter; it is a part of a Divine originator.

If this were only an Eastern tale, told by an ancient story-teller, he would have given life to his figure by agencies far different; the statement would be much too tame to meet his own inclination or the wishes of his listeners. He probably would have conferred life by placing the inanimate form in a running brook, in a position so that the clear morning light might afford supplementary aid in wooing the mysterious principle sought. He might have covered it with flowers, and pressed into the open mouth the rarest juices of plants, and fanned the nostrils with air charged with the rich aroma of flowers. Whoever wrote the first chapters of the book of Genesis, it is certain he was no ordinary chronicler; he was destitute of the gorgeous imagination so common to the authors of the legends and tales of the East, and was clairvoyant in a high degree. He must have had whisperings from unseen sources, and been directed by a wisdom not common to the men of the times in which he lived.

The story of the genesis of woman is held to be even more fanciful than that of man, but it is not difficult to detect in it those points of difference which separate the tale from the wild imaginings of the wisest of the early Hebrew chroniclers. The relations of the sexes is, by the proceeding of forming the woman out of man, declared to be more direct and intimate than that of any other; and whatever was desirable and wonderful in man, woman must by her origin be possessed of. The narrator did not regard it as necessary to go again back to the earth for materials from which to form the woman, nor was it necessary for Jehovah to inflate the lungs by his breath; like is assumed to be competent to produce like, and from the physical man woman was formed.

What is called the Mosaic account of the genesis of man, taken as a whole, must be regarded, even by evolutionists, as remarkable. Whether it is designed to present the details of actual occurrences, or whether the story has a typical significancy, a figurative meaning, is not clear. If its whole scope and intent is to reveal to races of men in all ages the fact of the supernatural origin of man, considering the circumstances under which the narrative was presented, and its influence upon those who were to people the earth thousands of years after the ignorant Hebrews had been resolved back to dust, it is not easy to see what statement could better serve its purpose. It has no force, viewed as a strictly scientific problem, and finds no place in purely scientific literature, but it does command the respect and enlist the interest of some of the most competent scientific investigators of the age.

THE ORBIT OF THE DOG-STAR.

One of the most interesting of the many applications of that marvellous instrument, the spectroscope, has been in detecting the motion of stars along the line of sight; that is, directly towards or away from the earth. This motion causes a peculiar displacement of the spectral lines, the direction and amount of which show the direction and velocity of the motion. By this method it has been found that Betelgeuse and Rigel, the two brightest stars in Orion, are receding from us, the one at the rate of 22 miles a second, the other of 15 miles a second. Arcturus is approaching us with a speed of 54 miles a second; and the one of the two "Pointers" in the Great Bear which is nearer the pole is travelling towards us 46 miles a second. Of the twin stars Castor and Pollux, the former is receding at the rate of 25 miles, and the latter approaching at that of 45 miles, a second.

This spectroscopic measurement of stellar motion was first made by Dr. Huggins, and at the time of his earliest observations on Sirius that star was moving away with a velocity of 29½ miles a second. Since then this has been a gradually diminishing quantity, and for a time last year Sirius appeared to be stationary. Now the measures recorded in the *Monthly Notices* of the Royal Astronomical Society for March show that the sign of the star's motion in the line of sight has changed, and that Sirius is approaching us again. This is a most remarkable confirmation of the hypothesis that the Dog-Star is describing a stupendous orbit round some invisible centre.

Alphonse Karr, talking of food adulteration, remarked: "It's very curious, is n't it? If I poison my grocer, the very lightest sentence would be hard labor for life; but if my grocer poisons me — ah, that 's a different thing! — he is fined forty francs."

A HINT FOR YOUNG READERS.

The following, from a juvenile magazine, may be suggestive to some of the sharp-eyed boys who read the Journal: —

A poor lad living near Philadelphia was invited, a couple of years ago, by a wealthy friend in town to dine with him. Among the dishes new to him on the table, he noticed that one which he particularly relished was set down on the menu as "Fillet de bœuf aux champignons." A sharp scrutiny showed him that the "champignons" were only mushrooms, such as he had gathered on the sheep walks. These, however, as his friend explained to him, were of finer quality, and had been cultivated and canned in France. They sold at retail, his friend explained to him, readily at sixty cents a can. Strolling through the market the next day, the boy saw one or two quart baskets of native mushrooms marked at that price.

"Is there much demand for these things?" he asked. "We do not think much of them in the country."

"They are considered a rare delicacy," said the man, "but only epicures can afford to buy them."

The lad passed on with a new thought in his brain. Why could he not grow mushrooms? He was poor, to be sure, and had little time to spare from his regular work, and had no land. Here was a crop which he had been told could be raised in a cellar, one for which there was already a demand which could easily be increased, and no supply.

He went home, and during the next few weeks read every book he could find on mushrooms, laid out beds in a back cellar, manufactured his spawn with a few old mushrooms and the manure heap, and last fall filled the market with his boxes of tiny silvery buttons, blushing delicate pink. They were of precisely the same quality as the French canned champignons, only they were dewy, fresh, and sold at twenty cents. Epicures eagerly filled their baskets, and others who had never tasted them, in the prevailing high prices of all kinds of food, tried the new cheap vegetable and came again and again. The crop fairly took the market, and the boy has already laid up a snug sum toward going to college.

SCIENTIFIC BREVITIES.

The Color of Pure Water. — There has been some difference of opinion as to the color of perfectly pure water, and a German journal says that Victor Meyer has been investigating the matter. He finds that the color is neither blue nor green, but a shade between the two. To demonstrate this he takes five glass tubes, 40 mm. in diameter, and about 1½ meters in length; these are connected by means of rubber tubing forming a tube about 7½ meters long. Both ends of this tube are closed with glass plates fitted in metal sockets. The latter are furnished with brass nozzles for filling the tube. The tube itself is placed in an exactly horizontal position and covered with a black cloth. Upon looking through the empty tube the field of vision appears perfectly colorless, the cloth and the metal sockets preventing the color of the glass from exerting any influence; as soon, however, as the tube is filled with distilled water, an intense bluish-green color is observed.

Magnetic Music. — At the late Paris Exhibition, an instrument which excited much curiosity was the *fan-fare* of M. Aden, a trumpet arrangement which amplified to the strength of a hunting-horn airs sung lightly into the transmitter of a singing condenser. The mechanism by which this was accomplished is now made known in *La Lumière Electrique*. It consists of a horseshoe magnet, having at its polar extremities two flat bars of soft iron

turned towards each other (so as nearly to meet), with flattened coils not reaching the extremities. In front of these ends is a small, very light armature, supported on a small wooden knob, which is attached to a very thin slice of pine that forms the vibrating diaphragm. It is in front of this diaphragm that the resonance-case is placed, into which the trumpet is inserted. The distance of the small armature from the magnetic poles is so regulated that at the moment of action of the current a shock occurs, and the repetitions of these shocks give the resultant notes. It had been attempted to apply the system to reproduction of speech, but the few words obtained were so indistinct that the idea was given up.

Sanitary Science as a University Study. — Sanitary science has been recognized by the Royal University of Ireland, and is introduced into the new scheme adopted by the Senate. The subjects required for a diploma are of wide extent, as will be seen from the following programme: Climate — A general knowledge of meteorological conditions; the reading and correction of instruments, and tabulating the results of meteorological observations. Chemistry — Constitution of the atmosphere; pure and impure waters; food. Geology — The character and structure of rocks, with reference to water-supply and drainage. Physics — Laws of heat, mechanics, pneumatics, hydrostatics, and hydraulics, or sanitary engineering; the construction of dwellings, barracks, hospitals, schools, factories, etc., in accordance with the principles of warming, ventilation, drainage, water-supply, etc. Vital statistics — Hygiene, including the causation and prevention of disease; sanitary law. The examination in chemistry shall include a practical part on the chemical and microscopical examination of air, water, food, poisonous substances used in manufactures, etc. The examination in physics shall embrace the reading of plans, sections, scales, etc., in connection with buildings.

Utilizing Liquid Carbonic Acid. — Krupp, the great gun manufacturer, is said to be employing at his works a very ingenious way of recovering the coils of guns which have become useless. He heats the barrel to redness, and then introduces liquid carbonic acid. The cold thus produced causes shrinkage and allows the coils to be removed.

A New Use for the Microphone. — The *Popular Science Monthly* for June has the following curious note on the use of this instrument: "A wealthy landowner in the Tyrol has made an application of the microphone to the detection of subterranean springs. He fixed the microphones at the spots where he supposed water might exist, each being connected with its telephone and battery. Then, at night, he put his ear to each of the instruments and listened for the murmuring of the waters, and in several cases heard it."

Thrift and Science. — The *Univers* professes to explain the mystery of the collection of used postage-stamps. It states that the indigo used in printing them being rather expensive, the French post-office itself buys back the old stamps, and skilled chemists are employed to extract the indigo, so that it may be again employed in making new stamps.

The Phonograph in Education. — The Polyglot Institute at Paris proposes to try a phonograph of new construction, in order to teach its pupils how to pronounce correctly the difficult words of foreign languages.

Rose-Leaves and Latin. — A correspondent of the London *Medical Times and Gazette* writes: Visiting lately a friend, who is at the same time a zealous florist and consummate Latinist, I found him in his garden, where he called my attention to the curious fact that, of the five sepals of the rose, two have the entire margin serrated, two have smooth margin, and one has one half of the leaf with smooth and the other half with serrated margin; and repeated the following lines, which were new to me, and which, as they may be so also to many of your readers, I will here transcribe: —

"Quinque erant fratres in eodem tempore nati;
Duo erant barbati; duo sine barbâ nati;
Et alter qui manebat, solum medium barbam tenebat."

HOUSEHOLD HINTS.

Safe Lotions for Freckles. — The following are safe for use in "domestic medicine:" —

(1.) Moisten the finger with water, dip it into finely-powdered nitre, and apply it to the freckles. Patiently continued, this remedy is said to be a sure one.

(2.) A solution of borax in water — a drachm to the pint — applied night and morning.

(3.) Sal ammoniac, one drachm; pure water, one pint; lavender or cologne water, one quarter ounce: mixed, and applied with the finger night and morning.

Besides these, there are various mercurial washes and ointments, such as the citrine, which are efficacious in many skin troubles, but are attended with such danger that some skilled physician or some educated druggist should direct their use in every case.

Buttermilk as Summer Food, Drink, and Medicine. — A recent writer asserts that for a hot-weather drink nothing equals buttermilk. It is, he says, "both drink and food, and for the laborer is the best known. It supports the system, and even in fever will cool the stomach admirably. It is also a most valuable domestic remedy. It will *cure* dysentery as well as and more quickly than any other remedy known. Dysentery is really a constipation, and is the opposite of diarrhœa. It is inflammation of the bowels with congestion of the 'portal circulation' — the circulation of blood through the bowels and liver. It is a disease always prevalent in the summer and autumn. From considerable observation I feel warranted in saying that buttermilk, drunk moderately, will cure every case of it; certainly when taken in the early stages."

Cleaning Greasy Bottles. — The following preparation is recommended as an efficient solvent for grease in obstinately dirty bottles: Take of castile soap, in shavings, 4 oz.; carbonate of soda, 2 oz.; borax, 1 oz.; aqua ammonia, 7 oz.; alcohol, 3 oz.; sulphuric ether, 2 oz.; add soft water sufficient to make one gallon. The soap should be boiled in the water until it is dissolved, and the other ingredients then added.

Sticky Fly-Paper. — A correspondent of *New Remedies* commends the following as cheap and effective: In a tin vessel melt one pound of resin, and then add about two fluid drachms of linseed oil. While the mixture is warm, dip the spatula into it, and spread what adheres to the blade on foolscap paper, after which it may be allowed to cool. I have learned by experience that different samples of resin require different proportions of oil. When the mixture is found to be too hard for spreading, more oil may be added; if too soft, add resin.

To Prevent Wooden Vessels from Cracking. — Wooden bowls and other ware of this sort, as well as all cross-sections from tree trunks, and short logs cut for various purposes, are very apt to crack and split while seasoning. To prevent this completely, the pores of the wood should be well filled with linseed, or some other vegetable oxidizing oil, while it is yet green, and before it begins to show any signs of cracking or checking. This will completely obviate this inconvenience.

Soft Beds. — Why should soft beds be considered unwholesome? Certainly they afford more comfort than hard ones. Hard beds should never be given to little children, and parents who suppose that such beds contribute to health by hardening and developing the constitution are surely in error. Eminent physicians, — both here and in England, — concur in this opinion, and state that hard beds have often proved injurious to the shape of infants. Birds and animals cover their offspring with the softest material they can obtain, and also make soft beds for them; why not do the same with our own young?

To Preserve Eggs. — A correspondent of the London *Morning Post* writes as follows: "Place the eggs in a cabbage-net, and dip them in a saucepan of boiling water for eight or ten seconds. For all culinary purposes they will keep almost indefinitely."

Practical Chemistry and the Arts.

SIMPLIFIED MILK ANALYSIS.

The standard methods of milk analysis are too tedious for application to large numbers of routine examinations, and a process which, giving fairly correct results, could be completed in an hour or two, and safely entrusted to assistants, would present obvious advantages. Such Dr. Vieth claims for the method employed by him at the laboratory of the Aylesbury Dairy Company, London, where from fifty to sixty different samples of milk are examined daily with a precision and constancy in the results seemingly but little inferior to those attained by any analyst. His method does not greatly differ from those pursued at the great German dairy stations of Raden, Kiel, and Proskau. Since coming to England, Dr. Vieth has learned to appreciate the importance of a separate statement of the *solids not fat*, which is not sufficiently recognized in Germany, but he also attaches more value than English analysts to the specific gravity, which he takes in three hundred samples daily. This he finds to average 1.0315, being generally between 1.030 and 1.033, and never, in England or in Germany, has he known it to fall below 1.029, or rise above 1.034, though the mean specific gravity of German milk is somewhat lower than English.

Dr. Vieth's method is thus described in a London journal: —

For the estimation of water and total solids the milk is simply evaporated in a glass or platinum dish as usual, avoiding too high a temperature, for, as Dr. Schmöger points out, 100° to 105° C. will drive off from the milk-sugar all water of crystallization, but one of 110° to 115° C. partially decomposes the proteids, if not also the sugar, entailing an apparent loss. For the fat Dr. Vieth now commonly uses the lactobutyrometer of Marchand; but he considers Soxhlet's extraction process as the very best method yet proposed. Ten grams of milk, having been dried with sea-sand or powdered glass, are put into a case of filtering-paper, closed with cotton-wool, and the fat extracted in the apparatus by pure dry ether. This takes about an hour; the ether is then distilled, and the residual fat is weighed. The estimation by the lactobutyrometer is simpler, and is finished in about twenty minutes, a boy being able to make twenty or more examinations in an hour; and Dr. Preusse, in the recent volume issued by the Imperial Board of Health of Germany, speaks highly of it. Ten centimeters of milk are measured and placed in the tube, the same quantity of pure ether is added, with a few drops of a solution of caustic potash, and the tube closed and shaken. Again, 10 cubic centimeters of alcohol, which must be of a strength of 90 per cent. (not more), are

added, and the shaking repeated. It is now put to stand in water at a temperature of 40° C. (104° F.) until the fat has risen, and then in water at 20° C. (68° F.) for a short time, when the depth of the layer of ethereal solution of fat is read off, and the percentage of fat in the milk corresponding thereto ascertained by reference to a table. This method does not pretend to the same accuracy as the usual process, or Soxhlet's method of extraction, and gives no indication when the fat is less than 1.2 per cent.; but for routine examinations, or for examination preliminary to stricter inquiry, it is very useful, since so many samples can be scrutinized in so short a time that no case of serious dilution need escape notice. A public analyst might submit the milk of every small dairy to daily examination, and thus detect the offenders who now elude his vigilance. The total solids and the fat being ascertained, the solids not fat are easily calculated, but for the separate estimation of these Dr. Vieth dilutes ten grams of milk with 200 cubic centimeters of water in a beaker, precipitates the casein by acetic acid, avoiding an excess, collects it on a weighed filter, dries and weighs the filtrate. He then boils to precipitate the albumen, which is collected and weighed in the same way; and lastly, he estimates the sugar by titration with Fehling's solution. For such examinations he weighs the quantities, but in the daily work he prefers measurement by accurately marked pipettes. For the determination of the ash he evaporates ten grams of milk in a platinum crucible over a steam-bath, chars the residue, washes out the carbonized mass with boiling water, strains off the charcoal, returns the water containing the salts to the crucible, evaporates it, and finally heats it to a dark red. In these analyses he never allows a difference between the observations, which he always makes in duplicate, of more than 0.1 per cent. for the organic constituents, and proportionately less for the ash.

OUTLINE DRAWINGS UPON GELATINE DRY-PLATES FOR LANTERN PROJECTIONS.

BY GEORGE M. STERNBERG, SURGEON U. S. A.

THOSE who make use of lantern projections for purposes of instruction will be glad to know, if they have not already discovered it for themselves, that outline drawings, maps, mathematical and chemical formulas, etc., etc., may be readily sketched with the point of a needle upon the gelatine coating of the dry-plates, which are now being so extensively used, especially by amateur photographers.

Of course it is unnecessary that the gelatine plates should be sensitized, but this does not seem to be an objection to their use, and they can now be obtained from the manufacturers at such reasonable prices that few persons will care to spend time in attempting to prepare them for themselves.

The lines traced with a needle point, or some other sharp instrument, must cut through the gelatine coating, and the negative drawing made may be used as a lantern slide, or from it a positive may be printed upon another gelatine plate.

In the first case we have, of course, bright lines on a dark ground, which, for many purposes, are quite as satisfactory as a positive drawing would be.

Positives are readily made by placing a sensitized plate in contact with the negative, and exposing for an instant to the light on a dark day, or to the light of a gas-jet or oil-lamp in a dark room. The image is developed with a mixture of four parts of a saturated solution of neutral oxalate of potash and one part of a saturated solution of protosulphate of iron.

FORT POINT SAN JOSE, SAN FRANCISCO, CAL.,
May 18, 1882.

INDUSTRIAL MEMORANDA.

AN ELECTRIC ELEVATED RAILWAY FOR CHICAGO. — A new and promising scheme for an elevated railway is under discussion in Chicago, and a company has already been incorporated for carrying it out. The construction is intended to be very light, and instead of locomotives and long trains, single cars only will run over it, impelled by electricity conveyed to a small motor in the car, after the method already successfully employed by Messrs. Siemens and Halske at Berlin. The cost of construction, as well as the expense of maintaining a track designed only for such trifling burdens will be but a fraction of that needed for a road like that in New York, and as the conditions will be much more favorable for applying electricity as a motive power than they are at Berlin, where the system has long been in operation, it seems reasonable to suppose that the new road may prove completely successful. To avoid obstructing important streets, it is proposed to carry the track as far as possible through passage-ways and alleys.

RUSSIAN PETROLEUM. — According to the Berlin *Berichte*, the Russian petroleums have a greater illuminating power than the American by about ten per cent. Their specific gravity is higher, but they are more rapidly absorbed by the wick. Lubricant oils of a specific gravity of 0.940 are prepared from them without the admixture of any solid matter. The Russian petroleum contains less hydrogen than that from America, and does not yield any aromatic hydrocarbons on shaking up with fuming sulphuric acid.

MOVING A HOUSE BY RAILROAD. — It is reported in the daily papers that Joseph Cummin, master carpenter of the Long Island Railroad, removed a lathed and plastered dwelling, 18 by 24 feet in size, from Bethpage to Bellport, a distance of fifty-three miles, on two platform cars, and placed it on its foundations in thirty-six hours. The house was landed without the breakage of a window-pane, or a crack in the walls. The cost was about $1.50 a mile.

AN IRON TREE. — On the State House grounds at Columbia, S. C., there is an iron casting commemorating the South Carolina soldiers who died in the war, whose names are inscribed on brass tablets at the base. A correspondent says: "The success of this casting consists in its perfect imitation of the living palmetto, — the favorite tree of South Carolina. We had heard of this statue in other places, but had never been able to believe the stories of the flexible leaves bending in the breeze, supposing this phenomenon an optical delusion, but such is really the case. The long, thin leaves of iron, life-like, even to the hair-like fibres of the twigs and branches, wave tremulously in every zephyr, and the whole tree, painted artistically, has so close a resemblance to the real tree as to deceive the acutest observer at the distance of five rods."

METALLIC WRITING PENCILS. — These pencils consist, according to the *Industrieblätter*, of an alloy of lead, bismuth, and quicksilver. The ingredients vary according to the desired hardness of the pencils. The ordinary proportions are: lead, 70; bismuth, 96; and quicksilver, 8 parts by weight. A larger proportion of lead and quicksilver makes the pencil softer, and produces darker marks in writing. The lead and bismuth are melted together and allowed to cool somewhat, when the quicksilver is added, and the composition cast in proper moulds.

WOODEN VERSUS IRON POSTS IN BUILDINGS. — General Meigs, of the War Department, who has given some attention to the matter, states the superior advantages of thick wooden pillars thus: "The safest story post — that is, a post supporting a floor at reasonable cost — is one of some hard and not resinous timber. Posts of oak, of fourteen inches square, will stand safely through almost any fire, until the powerful force and means of our city fire departments are unable to quench the fire. If wrapped with wire netting, covered afterwards with plaster, they will suffer still less; but the naked wooden post will remain cool and strong in its centre for hours, and the fire will not for a long time char it to a depth sufficient to injure its strength much." It is believed that if round pillars instead of square ones were used as above there would be fewer available points for fire attack.

LABORATORY NOTES.

THE REACTIONS AND THE DETECTION OF GLYCERINE. — To detect glycerine in the possible presence of sugar, the liquid in question is mixed with powdered slaked lime and an equal bulk of fine quartz sand, and evaporated to a paste on the water-bath. When cold the residue forms a hard mass, which is pulverized and extracted with three and a half ounces of a mixture of equal volumes of absolute alcohol and ether in a small stoppered flask. On allowing the extract to evaporate, the glycerine is obtained free from sugar. If two drops of it are put in a dry test-tube with two drops of phenol (previously liquefied) and the same quantity of sulphuric acid, and heated very cautiously over the flame, but so as to reach 248° F., the formation of a solid brownish-yellow mass is perceived. When cold a little water is added, and a few drops of ammonia, when the brownish-yellow solid dissolves with a splendid carmine red.

It is, of course, much more important to detect sugar when used to adulterate glycerine. This may be effected by the first part of the above process. After the hard mass has been extracted with alcohol and ether, as directed, the residue, which is then free from glycerine, is treated with hot water, which dissolves sugar, if present.

A SIMPLE DRYING OVEN. — Dr. Vogeler, in the *Pharmacist*, remarks: The baking oven, sold with the coal-oil stoves now so much in use, will be found well adapted for this purpose. It answers an excellent purpose for making all kinds of scale preparations, including glycyrrhizin, as well as for extracts to be dried. The evaporation of small quantities of liquids is also nicely effected in this oven, since the temperature may be raised above that of the water-bath without incurring the risk of injuring the material. The drugs cannot possibly be injuriously affected by the products of combustion from the flames, seeing that the finest delicacies are daily cooked in these ovens.

PRACTICAL RECIPES.

PAPER BELTING. — It is reported in *Engineering* that paper belting is successfully used in the machinery-hall of an exhibition now being held in Japan. The Japanese have long been celebrated for their manufacture of some exceedingly tough descriptions of paper, and it is stated that the paper belting has been tested, and found much stronger than ordinary leather. Now that machinery is rapidly making its way into Japan, the manufacture of this paper belting is of special interest to the country, as from the want of proper tanning good leather is not made by the Japanese.

TO KEEP SPERM OIL FROM GUMMING. — If kerosene oil is added to sperm oil, it will prevent the latter from gumming. Mix thoroughly 100 parts of oil with four parts chloride of lime, and twelve

parts of water. Now add a small quantity of the decoction of oak bark to destroy all traces of gelatinous matter still remaining, and allow the impurities to settle. Next agitate the clear part with a little sulphuric acid; settle once more, and remove the acid by washing, and see to it that none of the acid remains. If the oil shows any signs of becoming rancid, it ought to be boiled with water and a little bicarbonate of magnesia for about fifteen minutes, when it will likely lose the power to redden litmus paper.

For Waterproofing Textile Fabrics. — A Leipsic paper gives the following recipe for making clothes and textiles in general waterproof: 4½ oz. of glue are softened in 8¾ pints of cold water, and then dissolved in warm, and stirred along with 2½ oz. of soap. The clothes are boiled several hours in the solution, according to the nature of the fibre and thickness of the stuff. When thoroughly saturated, press out and dry in the open air. Then put in a bath made of 14½ oz. of alum, and 16½ oz. of salt dissolved in 8¾ pint of water. Lift, rinse with pure water, and dry in a temperature of 77° F.

Cement for Iron. — An exchange says: "Two parts of ordinary well-dried powdered loam and one part of borax are kneaded, with the requisite quantity of water, to a smooth dough, which must be at once applied to the joints. After exposure to heat this cement adheres even to smooth surfaces so firmly that it can be removed only with a chisel. Another cement for steam pipes is prepared by mixing 430 parts in weight of white lead, 520 of powdered slate, 5 of chopped hemp, and 45 of linseed oil. The two powders and the hemp cut into lengths of ¼ to $\frac{5}{16}$ of an inch are mixed, and the linseed oil gradually added, and the mass kneaded till it has assumed a uniform consistency. This cement is said to keep better than ordinary red-lead cement."

Agriculture.

FARMERS' ENEMIES.

It is unfortunate for agriculture that it has so many assumed friends and patrons who care much less for truth and progress than they do for their own selfish interests. The practical farmer is misled oftener and with greater misfortune by agricultural "bummers" and speculators than any one engaged in other industrial pursuits. He has not only to contend with meteorological vicissitudes, with wet seasons and dry, with winds, hail storms, and frost, with insects, blight, mildew, and weeds, but, worst of all, he is the victim of a class of men who, under the guise of friendship, mislead and perplex him beyond measure. Political "bummers" are bad enough and plenty enough, but the guise under which they act is so thin that it can be seen through by farmers of ordinary sagacity. The worst enemies of farmers are the class of men who profess to enter into their interests by lecturing or publishing journals ostensibly agricultural in aim, but really speculative and selfish in the highest degree. These dangerous men are like curbstone brokers, who lie in wait for new victims to pluck. If they print journals, these are made up of love stories, vapid farm talks, absurd statements, and a dash of sentimental poetry from Susan the milkmaid. To increase the circulation they use every method of getting up what they call "fights" among farmers; they go into the country and abuse the hospitality of rural entertainers, by reporting "interviews" with them which never occurred. The object is, to extort from Mr. A. some opinion about crops, corn fodder, silos, or something which is antagonistic to the expressed views of his neighbor B. This the trickster knows will be likely to create animositics in the neighborhood, and both parties will take his worthless sheet to learn how the fight goes on. What is now called the "ensilage fight" certain persons are endeavoring to turn to advantage in this way. They know nothing themselves about silos or ensilage, and care nothing about them; the aim is to strive to create antagonisms among farmers, and when the heat is up, espouse one side or the other and get subscribers to their journals.

There is no "fight" among the true friends of agriculture concerning silos or ensilage. The only question at issue is one relating to the *exact value* of ensilaged crops. While all agree that ensilaged corn fodder is of high value, very many dispute the impossible claims made for it, and the object is to save farmers from making mistakes and thus subjecting themselves to loss. It is better to know the exact truth than to be led by over-zealous men into serious disappointments and failures. The two agricultural journals in this city, the *Ploughman* and *Farmer*, have treated the subject in an able and impartial manner, and for their fairness deserve the support and confidence of all New England farmers.

CONCERNING GUANO.

Ages ago the primitive Peruvians had discovered the value of guano, and with its potent aid redeemed the rocky Sierra from its barrenness. They dug terraces on the precipitous sides of the Cordilleras, and fertilized the artificial soil with the rich manure, so that it bore abundant crops. It was long, however, before knowledge of this important agent reached Europe. Humboldt foresaw its utility, and got German chemists to analyze it. Sir Humphry Davy told English farmers that a new manure, far more valuable than that derived from the farmyard, was at their disposal. About 20 casks of it, shipped as an experiment, found their way to Liverpool in 1840, but it crept into use very slowly. It was not thoroughly appreciated until the time when Liebig gave an impetus to the scientific development of agriculture. The rich strata of guano in the South American islands then began to be sought from all parts of the civilized world. The Peruvian government soon recognized the fact that these immense natural dung-heaps were of more value than the mines of Potosi, and establishing a monopoly of the treasure-beds made the rest of the world pay well for the privilege of drawing from them.

It is the popular impression that these guano deposits are still of boundless extent and incalculable value. The Congressional and newspaper discussions on recent Peruvian diplomacy have tended to foster this notion, which, unfortunately, is a wrong one. The following statement from an article in the *Industrial Review* undoubtedly gives the facts in the case:

The supply of Peruvian guano may hold out 10 or 20 years longer, but those who are best informed make the limit somewhat shorter. The exportation began in 1842. Only 182 tons were shipped in that year. In 1852 the amount shipped to England, which has always controlled the trade, had risen to 435,000 tons. The Chincha Islands were the earliest source of the supply. More than 7,000,000 tons had been gathered on these islands up to 1872, when only 150,000 tons remained, and Peru closed them to foreign shippers, reserving the trifling amount that was left for her own use. In the four years succeeding 1870, over 1,000,000 tons were shipped from the Macabi and Huanape islands, and in 1875 only half a million tons remained. The Lobos Islands have been the source of the shipments of the last five or six years, though the Ballestas group have yielded a small quantity of a highly nitrogenized variety. In 1877 it was estimated that the total amount of guano remaining on the Peruvian mainland and the islands did not exceed 2,000,000 tons. It has lately been asserted that the Lobos islands' supply is nearly exhausted. At any rate, it is sufficiently evident that there are limits to the quantity of guano which we can expect Peru to furnish. There is no other known spot on the earth where the article is obtainable in quantities large enough to pay for exporting. Two conditions are essential to its production: a rainless climate, in order that the soluble phosphates may not be washed away; and an unfailing supply of fish in the ocean near by to supply the food of the innumerable hordes of penguins, cranes, divers, cormorants, flamingoes, and other sea-hunting birds of similar habits, whose accumulated excrement forms the deposits of guano.

If these conditions exist anywhere else than on the coast of Peru, the prying eyes of trade have not yet discovered the fact.

DARWINISM IN HORTICULTURE.

The London *Garden*, in an article on the death of Darwin, has the following suggestive remarks on the bearing of his theories upon practical horticulture, and we may add that they are equally true of agriculture in general: —

Among the many eulogies that will be written on the life, works, and death of Darwin, perhaps few will be more honest or sincere than those that are penned by practical horticulturists. At first sight it might appear that the theory of "evolution" and the "origin of species" had but little relation to practical horticulture. But this would be to take a very narrow view of the scope and aim of the latter. Besides, the wonderful array of facts which Darwin has gleaned from the wide field of botany and horticulture is in itself the most valuable contribution to the advancement of the science and practice of horticulture. Whatever advances our knowledge of vegetable life or enlarges our conceptions of its marvellous adaptations and forces likewise increases our power over it. Hence Darwin's facts, apart from the theories they establish, and with which his name will be forever associated, are so much more accumulated force and power over Nature placed within the reach of cultivators. In view of such facts as are marshalled before us in overwhelming force and number in such works as the "Origin of Species" and the "Variation of Animals and Plants under Domestication," plants are no more like dead chessmen, to be moved hither and thither on an unchangeable road of stereotyped modes of production, but rather so much living raw material, to be moulded into new forms and higher types at the bidding of cultural advancement or commercial necessities. If, as seems probable, so much of beauty, usefulness, value, have been evolved from the simple and primitive forms of past ages, how much more may yet be developed from the more perfect plants and products of the present day! Granting the truth of the theory of evolution, it follows, as a matter of course, that we have not yet reached the end of it. Hence the horticulturist must never rest and be thankful with present attainments. "Forgetting the things which are behind, reaching forward to those that

are before," must ever be his motto; "From good to better, from better to yet better still, and on towards an unattainable best," his watchword. Our material is plastic, not fixed. Forms, colors, statures, sizes, substances, qualities, products, all go to be altered, changed, enhanced, improved. This is our first, most valuable, and far-reaching lesson from Darwin's teaching. Well learned, it will show that the best of us are only on the threshold, and not on the top stone, of our victories over Nature. Plant life and its powers are a great deep, in which each of us has been dropping his short line, with which we may have drawn a few prizes. It remained for Darwin to reveal to us how fathomless and wide was the great sea of life, from which we have all been trying to filch our finished products.

With this expansion of our views of the nature of the plants we cultivate will come larger knowledge of new and more rapid ways and means of production. The truism that knowledge is power is never more true than when applied to plants and their culture. Ignorance rather than indolence is the most fruitful cause of failure in horticulture. Nor is the possession of knowledge all that is needful. A willingness to learn is almost equally valuable. In this, also, Darwin has shown us a perfect example. Perhaps the most learned man of this or any age, he was to the last one of the most diligent of scholars. He took lessons from everything, anybody. With a store of facts sufficient to stock a cyclopædia, he was ever gleaning more, from the pure book, — Nature. Neither was he ashamed to accept or acknowledge facts from the humblest practical gardener. Beasts, birds, plants, insects, were all his instructors. He, whose intellect was so keen and lofty as to grasp the theory of evolution, solve the problem of the origin of species, and propound a great many other theories, could sit quietly down, after these marvellous achievements, and learn from the earthworm how the bald, bare earth was covered with vegetable mould, and thus prepared for becoming the home of those plants which his wonderful discoveries seem to have clothed with fresh wonders, and endowed with new powers. Always learning, and never coming to the full knowledge of the truth, was his attitude from first to last; and the more we can imitate him in this, the more shall we surely know, and the more perfect shall our practice become.

AGRICULTURAL ECONOMIES.

The following, from the *New York Tribune*, may well be pondered by those who complain that farming is no longer profitable in many parts of New England: —

The profit of the future is to come in avoidance of wastes of the farm. As the country grows older, land dearer, and immigration heavier, competition waxes fiercer in all agricultural production. A ruinous share of the hay is lost, first, in cutting when ripened to woodiness or dried to hardened stems; then in giving it out to sustain life and animal heat rather than for fat and flesh. Corn is also thrown away by insufficient or injudicious feeding. There is enormous loss in keeping a poor cow that yields 300 gallons of milk per annum instead of one that produces 600 at about the same cost. One may bring the owner in debt, while the other affords a handsome profit on expense of keep. A cow that gives milk only from April to November, and runs dry when forage is costly and milk is dear, should have a few months' extra feeding, and go to the butcher as soon as possible. That a cow is dry for more than six weeks is the fault of the owner in not procuring "the survival of the fittest," and again, perhaps, in not supplying ample and succulent food at all seasons, while the milk habit of the young cow is forming. The loss in milk and meat by irregular feeding, and a change from fresh pastures to a straw stack and coarse hay during an inclement season, is an irreparable waste, which is projected into the succeeding summer without regard to the abundance of its pasture.

The losses from negligence, or want of skill, in the preparation for market, the manipulation or manufacture from raw material, is enormous. Milk of the same quality, of the same cost, makes butter at 15 cents and at 50 cents per pound. Mixed fruits sell in market at half the value of assorted samples neatly put up. The pig products of a famous Massachusetts farm are disposed of in New York city at 23 cents per pound, while similar goods from the average farm command but 13 cents. Skill, taste, neatness, and a well earned reputation for reliable excellence get the highest rewards, — give better dividends than the capital and labor represented in the product on which they are expended. There is solid money in these intangible valuables. But the wastes that may be avoided are numerous in every department of agricultural practice, and cannot be hinted at in a paragraph. They are illustrated in the differing costs and selling prices of the products of adjoining farms in every neighborhood of the land.

GLEANINGS.

Plant-Food and Fertility. — It is now recognized that a plant does not draw its food from a nutritive solution fully prepared, but prepares it itself by direct and intimate contact of its cells (which have always a slightly acid reaction) with the earth particles, in which nutritive elements have been fixed by way of physical absorption or chemical precipitation. The analytical chemist has to use strong mineral acids to redissolve these fixed matters, and there is the inconvenience that the acids also dissolve elements in combination by which a plant could not directly benefit. Hence imperfect information as to the degree of fertility of soils. M. Petermann is now seeking to develop a new method of analysis, namely, by dialysis of arable soil. In a preliminary paper to the Belgian Academy he finds that (1) arable soil yields to distilled water, from which it is separated by a vegetal membrane, the following nutritive substances: lime, magnesia, oxide of iron, potash, soda, chlorine, sulphuric acid, silicic acid, phosphoric acid, and nitric acid; (2) arable soil contains organic matters which pass easily, by diffusion, through a vegetal membrane.

An Old Italian Garden. — We find in a foreign exchange the following paragraph concerning the famous Giusti garden in Verona, well known to tourists: —

"The palace and garden of Count Giusti have been in uninterrupted possession of the family for over 1100 years. The garden, which is purely Italian in style, is furnished with hedges of privet and box, cut mural fashion, 2 ft. or more thick, and some 8 ft. in height. Its most striking features are its gigantic cypress trees, of which there are more than 200 specimens, some looking very healthy and youthful, though from 600 to 700 years old, and from 110 ft. to 130 ft. in height. A horizontal cypress growing here is said to be over 1000 years old, is 14 ft. in circumference at 3 ft. from the ground, and is 120 ft. high."

The Trials of Rose Culture. — A recent writer on the cultivation of the rose remarks: "No one can be more profoundly impressed with the curse entailed on Adam and his descendants than the reverent rosarian; for all that is hostile and bad, animate and inanimate, seems to combine in greater degree to prevent the successful cultivation of the rose than is the case with any other well-known flower. The price to be paid for beautiful roses is eternal vigilance, inspired by love."

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, JULY 1, 1882.

SICKNESS AMONG STRANGERS.

Very many people who leave homes in cities for the country, seashore, or mountains, in summer, have a dread of illnesses which may occur during their absence. It is certainly bad enough to be prostrated by illness when at home, surrounded by friends and good nurses, and attended by physicians who understand the idiosyncrasies or morbid tendencies of individuals; but it is far worse to be prostrated in crowded hotels or boarding-houses, with none but strangers to attend upon one's wants. Money will aid in providing all usual wants, but the comforts of home and one's own bed cannot be purchased when away as summer tourists or boarders.

It is well for those who go away to provide a few simple remedies, which may be used with safety in cases of accident or sudden illness. The fluid extract of ginger is to be named first as a valuable remedy. It is a cordial aromatic, useful in sudden colds and chills, for disturbances of the digestive organs and bowels. It is all that is needed as a remedy in more than one half the indispositions of travellers. Another remedy exceedingly valuable and safe in the hands of sensible, intelligent persons is what is known as *Dover's powder*. It is compounded of opium, ipecac, and sulphate of potassa, and is valuable as a diaphoretic and hypnotic. In cases of slight febrile symptoms, with hot skin and thirst, it is almost a specific, and the same may be said of it in cases of disordered bowels, diarrhœa, etc. As much of this as can be held upon half the surface of a small penknife blade is a safe dose for an adult. Of course, if travellers happen to be ill where educated physicians are at hand, this remedy had better be given under their directions. Mustard plasters are now prepared in very neat and permanent forms, and should be placed in the catalogue of useful agents; and also adhesive plasters, to be used in cases of cuts and other wounds.

Aperient remedies are often necessary, and the Sal Rochelle is about as safe and useful as anything. We are not advocates of dosing; it is better, if you can, to bring all medicines back with you on your return; but it is well to know that you have them, in case of absolute need.

And now a word to physicians who are called to attend upon strangers. It is important to remember that it is safer to deal gently with patients whose constitutional peculiarities you do not understand than heroically and at a venture. The New England States will be swarming with people from the far South and West during the summer, and the methods of treatment suited to the cold New Englander may not be best for those of hotter blood. Some acute diseases require prompt treatment, but nine tenths of the common ailments had better be left to good nursing and to nature. What is wanted of a physician attending upon strangers is kindly attentions, words of encouragement, and promptness of duty. We hope that our summer retreats in the country have been so far provided with pure

water and good drainage that they will prove to be health resorts rather than breeders of contagion.

LEMON-JUICE AND LONGEVITY.

MANY are the ways that have been suggested for postponing old age, but apparently with small success in avoiding this ill that flesh is heir to, unless it succumbs to other ills that attack it earlier. The only sure rule for escaping the regular approach of senility is that of persons whom the gods are said to love, namely, by dying young. To live long without growing old is the dream of physiologists and philosophers, but its realization is very slow and gradual. The average duration of life is increasing, and with the advance in hygienic and sanitary science we may hope that the gain will be accelerated from generation to generation; but we cannot hope that it will become very marked in our time.

The latest method for securing a green old age is that of Dr. William Schmöle, Professor of Pathology at Bonn, who has written a book, the title of which, being translated, is "A Scientific Method of Prolonging and Making Comfortable Human Life." He bases his method upon the hypothesis that the condition known as old age is produced by a misproportion between the organic framework and inorganic constituents of the human body. In order to prevent this condition and preserve the elasticity of youth, it is only necessary to introduce some substance which will dissolve the excess of mineral matter and allow of its absorption and excretion. Such substances are the inorganic acids, and chief among these, citric acid, the next in value being lactic acid. Citric acid is best taken in the form of lemon-juice, and it is recommended that a person swallow the juice of from two to eight lemons daily, year in and year out! Such a practice also secures one against the attacks of rheumatism, which afflict old age. It also prevents the degeneration of the arteries and the calcification of the vascular system. Our author also avers that many of the fevers and inflammatory diseases of old age are due to reflex and sympathetic processes. He states that a treatment which benumbs these reflexes will tend to ward off such complications. For this purpose he advises small and frequently repeated doses of acetate of morphia. The number of cases illustrating the effects of this new elixir vitæ is small as yet. One person, who fed himself on lemons as directed, died at the age of 110, and then his death was an unnatural one.

Readers of the JOURNAL who may try this simple method of comfortably lengthening out their mortal span are invited to report the results. Our successors in the editorial chair half a century or more from the present time will doubtless be glad to print the communications.

SANITARY EXPERTS AND MASSACHUSETTS LEGISLATORS.

THE *Boston Medical and Surgical Journal* gives the following sharp rebuke to our State legislature for its treatment of the sanitary experts who testified concerning the temporary discharge of sewage into Dorchester Bay: —

The city of Boston at present discharges its sewage upon flats, which are bare at low water, and in the immediate vicinity of its densest population. This has been going on for years, and at times a nuisance results. The construction of the tunnel under Dorchester Bay, and of the outfall works on Moon Island, necessary for the discharge of the city sewage into the outer harbor, has been unavoidably delayed, and cannot be completed for two years. The legislature was petitioned to prevent the discharge of the city's sewage, pending the completion of the tunnel and outfall works, into Dorchester Bay, a project entertained for relieving the old flats, which have been thoroughly drenched in past years. A joint special committee of the two branches was appointed for a hearing on the subject. Some few representatives of the comparatively sparse population around the bay remonstrated; on the other hand, Mr. J. P. Davis, formerly city engineer, Mr. E. S. Philbrick, a civil sanitary engineer of well-recognized capacity, Mr. W. H. Bradley, superintendent of sewers of Boston, Mr. E. C. Clarke, first assistant engineer in the construction of the new sewers, Dr. S. H. Durgin, city physician, and Dr. Walcott, secretary of the Health Department of the State Board of Health, Lunacy, and Charity, all testified, with the weight of their respective and varied trained skill and experience, that the discharge of the sewage into Dorchester Bay for two years, pending the completion of the tunnel and outfall works, would greatly benefit the older parts of the city, and in no wise injure the districts around the bay.

The estimable joint committee, after listening to such testimony, took about as many minutes for deliberation as can be counted on the fingers of two hands, and then unanimously recommended that the city of Boston be restrained from discharging sewage at Old Harbor Point, Dorchester Bay.

Now the strangest part of it all is that this joint special committee represented a legislature which only a few weeks ago refused all legislation on the petition of the inhabitants of the town of Millbury for relief from the sewage of the city of Worcester, discharged into the Blackstone River, on the ground that, though an offensive smell was shown to result therefrom, a nuisance had not been created, as it had not been proved that any one had been killed thereby. When the representatives of our middle-class virtues see fit to legislate in this fashion, it is of little profit to rummage in the dictionary for adjectives, — an outlet to outraged intelligence which we leave to those of our readers who have a taste for it, — merely suggesting that they avoid such epithets as dishonest or ignorant, which are too vigorous for the kind of legislation, or pretence at it, we have been describing, and look rather among such words as trivial and frivolous for suitable characterizations. . . .

We have not heard any one accuse this legislature of being corrupt or wicked, but only of being very weak.

GALVANIZED IRON FOR WATER-PIPES.

A CORRESPONDENT of the *Sanitary Engineer* sends the following query to that journal: —

Can galvanized iron pipe be safely used for water supply: first, with a soft water like the Croton; second, with the very hard water of limestone regions, such as is found in the St. Lawrence valley in this State?

The editor gives the following sensible reply, which accords with the teachings of the JOURNAL years ago, when the subject was much discussed by some of our contemporaries: —

There is some difference of opinion on this question, some claiming that the use of zinc or galvanized iron pipes or tanks is always attended with injurious results, while others say they can be employed with safety. The solvent action of water on zinc depends upon the amount of chlorides present, increasing as the chlorides increase. On the other hand, the presence of carbonates in the water greatly retards the solvent action on the zinc. There are on record a number of cases of zinc poisoning by the use of galvanized iron pipes; and it is evident that the danger depends, to some extent, upon the method of using this material. Tanks lined with zinc or galvanized iron should not be employed for storing water intended for drinking or culinary purposes, as the continued contact of the water and metal increases the amount of contamination. For the same reason, pipes of zinc or galvanized iron should never be allowed to remain in contact with the water in a well, as the zinc is soon corroded and dissolved. This action is increased, in the case of galvanized iron, by the exposure of the iron in connection with the zinc. Pipes of galvanized iron could be used for conveying running water with little danger of serious contamination, although experiment has shown that even in this case the zinc is more or less acted on, depending upon the nature of the water. To say in what particular cases these pipes might be used would require certain information as to the amount of the chlorides and carbonates present in the water. It is therefore clear that no rule can be laid down; but enough has been said to show under what conditions there would be the least danger. Of course, if one would always be on the safe side, he should use no material which under any circumstances could produce injurious results.

IN BEHALF OF THE PUBLISHERS.

MANY subscriptions to the JOURNAL expire at this middle point of the year, which used to be the regular beginning of the volume; and the publishers ask that we will call attention to this fact, and suggest a prompt remittance of the trifling amount required for the continuance of the subscription. Some of our friends will receive reminders that former bills have not been paid; and it is hoped that these little claims will also receive the attention to which they are entitled. In making payments the directions in the "Special Notice" on page 84 should be carefully followed.

METEOROLOGY FOR MAY, 1882.

THE sum of my observations on the weather for the past month and quarter is as follows: —

Average Thermometer.		Lowest.	Highest.	Range.
At 7 A. M.	47.00°	37°	69°	32°
At 2 P. M.	58.38°	42°	79°	37°
At 9 P. M.	48.64°	36°	67°	31°
Whole month	51.34°	36°	79°	43°
Second average[1]	50.67°	36°	79°	43°
Last 19 Mays	56.118°	51.34° in 1882	64 28° in 1880.	12.94°
Second average[1]	55 06°	50.67°	68.64°	12 97°
Spring of 1882	43.20°	16°	79°	63°
Second average[1]	42 73°	16°	79°	63°
Last 19 springs	43.93°	38.57° in 1869.	49 09° in 1878.	10.52°

[1] Found by adding the average evenings *twice*.

The average barometer for the month was 29.977 inches, the lowest, 29.51, on the 14th, and the highest, 30.32, on the 18th: a range of only .81 of an inch. The average for the last ten Mays has been 29.936, the lowest May, 29.868, in 1874, and the highest, 30.001, in 1881: a range of .133 of an inch. The sum of daily variations was 5.26 inches, an average daily movement of .170 of an inch. The average for the last ten Mays was .125, with extremes of .073 and .170.

The face of the sky in 93 observations gave 48 fair, 8 cloudy, 23 overcast, and 14 rainy. The amount of rain was 4 60 inches, the largest amounts during the last 14 years. The smallest amount was only .55 of an inch, in 1878. The average for the past 14 years was 2.833 inches.

The prevailing direction of the wind was N. 45° W.; the excess of the northerly and westerly over the southerly and easterly was the same, 18 observations each. The average direction approximately for the past 13 Mays has been west 12° 25′ north. During these years there has been an excess of southerly observations three times, — 6 in 1876, 27 in 1879, and 26 in 1880; while the easterly have excelled the westerly only twice, 28 in 1870 and 3 in 1881.

The past May has been remarkable for its low temperature and abundant rain, exceeding every May in these respects since my records began. During the night of the 2d, ice was reported formed one fourth of an inch thick, and so late as the 18th hail came mingled with the rain. For about ten days, near the middle of the month, we had a cold storm, with little variation of temperature. The range was only 2° on the 12th, varying only from 42° at 7 A. M. and 2 P. M. to 40° at 9 P. M. Other days varied but little more: only 3° on the 20th, 4° on the 11th, 14th, and 15th, and 5° on the 13th. During the 11 days from the 11th to the 21st, the wind gave 19 observations northeast, 5 north, and only 1 southerly. The first part of the month very little rain fell, and as we had a dry April the soil and streets became very dry and dusty; but later rains were abundant, and laid good foundation for a heavy crop of hay. The variations of the barometer were the largest for the last ten Mays. The overcast and rainy observations were also unusually numerous. On the 23d was a fine aurora, the first noticed this season.

Notwithstanding so cold a May, the entire spring has been but little below the average. March, being much above the average, gave tokens of an early spring, now reversed by a cold May to a late one, being from a week to ten days behind the average. It was nearly three weeks behind that of 1880, as shown by the date of fruit blossoms. D. W.

NATICK, *June* 7, 1882.

MASSACHUSETTS COLLEGE OF PHARMACY.

THE annual meeting of the Massachusetts College of Pharmacy was held at College Hall, June 5th, and was called to order at 3.30 P. M. by the President, Mr. Solomon Carter. The several committees reported the college advancing prosperously, and the Treasurer's report showed that the institution was in a good condition financially.

A unanimous vote of thanks was tendered Mr. Thomas Dolliber for the able and efficient manner in which he had performed the duties of Treasurer.

Prof. Geo. F. H. Markoe, who has been Corresponding Secretary for the past sixteen years, read his report, and as he declined a reëlection it was voted unanimously that the thanks of the college be tendered him for the faithful manner in which he had attended to the duties of Corresponding Secretary.

It was voted that the Board of Trustees shall set aside a sum not less than three hundred dollars a year for the Building Fund.

On the recommendation of the Board of Trustees a committee of three were appointed by the chair (Messrs. Sheppard, Dolliber, and Markoe) to revise the by-laws of the college and Board of Trustees, and report at next meeting.

The following officers were elected: President, Mr. Henry Canning; First Vice-President, Mr. Edward S. Kelley; Second Vice-President, Mr. Wm. W. Bartlett; Recording Secretary, Mr. Wm. F. Sawyer; Treasurer, Mr. S. A. D. Sheppard; Auditor, Mr. Lewis D. Drury; Corresponding Secretary, Mr. Chas. C. Williams; Trustees, Messrs. Solomon Carter, F. H. Butler, Silas S. Bradford, Geo. F. Dinsmore, John D. Knowlton, E. Waldo Cutler, Henry K. Appleton, Edward E. Babb.

The following gentlemen were appointed delegates to the American Pharmaceutical Association: Messrs. Benj. F. Stacy, F. H. Butler, Saml. A. D. Sheppard. Delegates to Conventions of Colleges: Messrs. Prof. G. F. H. Markoe, S. A. D. Sheppard, and Wm. W. Bartlett. Prof. B. F. Davenport, Registrar.

Mr. Thomas Dolliber was elected Trustee of Building Fund.

EDITORIAL NOTES.

THE SILICATED CARBON FILTER. — Mr. James F. Babcock, of this city, states that he has made analysis of water before passing through the Silicated Carbon Filter, and afterwards, with the following results: —

	Before.	After.
Total solids	15.45	10 23
Organic matter	0.85	0.44
Lead (metallic)	1 00	none
Chlorine	4.20	2.45
Albuminoid ammonia, parts per million	15.00	0.04

The figures, except for ammonia, represent grains per gallon. This result would seem to show that this filter is of great value in rendering impure water potable, or safe for domestic uses.

A PUZZLING ADDRESS. — A foreign exchange, referring to the exploits of the English postal authorities in making out "blind" addresses, tells of the success of a London expert, many years ago, in unravelling a mysterious scrawl on a letter which had defied all official skill, and had puzzled him for a long time. It proved to be a letter posted at Naples from Salvatore, the once-celebrated cicerone of Vesuvius, who was wont to send reports of the volcano's doings to the scientific persons he had conducted up the mountain. The letter was addressed, —

Toserumthedevebard
Inglande

After weeks of examination he at last discovered this to be: To Sir Humphry Davy, Bart., and the letter was forthwith delivered to the great chemist.

DUELLING BY STUDENTS. — Not only in the German Empire itself, but in the German-speaking canton of Switzerland, the Legislative Councils have been discussing the abolition of duelling. The Government Council of Zürich has issued a severe ordinance against academical duelling under any form whatever. The *Neue Züricher Zeitung* states that about one hundred students of the University of Zürich, indignant at the attack of the state upon the ancient liberties of the candidates for a medical, legal, or theological career, have assembled, and pledged themselves by resolution to leave the University and pursue their studies (and their brawling) under the protection of some less chicken-hearted *Alma Mater*. But it is also stated that the ordinance is simply a re-proclamation of the old (still unabrogated) law of Zürich against duelling.

TOO MUCH WRITING IN PRIMARY SCHOOLS. — A correspondent of the *Journal of Education* says: "Excessive writing in the primary grade is misshaping the fingers of the children. Children have gone home to their parents complaining of pain, and it looks now as though the physician will soon be interested in primary-school methods. Perhaps a critical survey might see sources of danger to the eyes and other parts of the body. Certainly any method, or any labor asked of a young child, which produces malformation or injures any organ of the body, ought never to be installed in a school-room as a thing to be worshipped."

A CENTURY OF A PROFESSORSHIP. — The professorship of anatomy, now held by Dr. Oliver Wendell Holmes, was established in 1782, when the Harvard Medical School was founded. The position was first filled by Dr. John Warren, who was succeeded by his son, Dr. John Collins Warren; and, in 1847, Dr. Holmes assumed its duties, upon the resignation of Dr. Warren. There is no other institution in the country where for a century a professorship has been held by only three men.

ATOMS.

THE number of students at the University of Vienna during the past term was 4823. This is the largest attendance known there for two centuries, and places Vienna at the head of all the universities of Austria-Germany.

VARIOUS hollow glass objects (beads, pearls, etc.) are now prepared with the aid of Balmain's luminous paint, by a German firm, Schellhorn and Söhne, in Lauscha, Thuringia; so that, after exposure to strong light, they shine in the dark.

PROFESSOR DUFOUR has presented a new and an interesting proof that the earth is round. The images of distant objects reflected in the Lake of Geneva in calm weather show just the degree of distortion which a careful mathematical calculation would predict on account of the shape of the earth.

AT Buckland, in England, a very fine elm-tree of great age, which was the principal ornament of the churchyard, was blown down and split by the recent gale, when it was discovered that the enormous trunk was a beehive, containing an accumulation of honey weighing over three hundred weight.

"WHAT did you say the conductor's name was?" "Glass, — Mr. Glass." "Oh, no!" "But it is." "Impossible! It can't be." "And why not, pray?" "Because, sir, Glass is a non-conductor."

FOOTBALL was an early and favorite sport with the English. Fitzstephen mentions it among the games of the Londoners in the time of Henry II. Pepys, in his "Memoirs," 1664, also speaks of the game.

THE sardine has disappeared from the coast of Brittany, where it used to bring the fishermen an annual revenue of fifteen million francs. M. Blavier thinks that some change in the direction of the Gulf Stream may account for the fact.

A FATALITY has just occurred where the nursemaid, in presence of children, had half-filled the bath with boiling water, and then proceeded to fetch some cold water. In her absence a boy fifteen months old fell over the edge of the bath into the hot water, and was so terribly scalded that he died almost immediately. In preparing warm baths, especially for children, the cold water should be put in first.

PROFESSOR HAECKEL reports from Ceylon that he has finished his zoölogical work on the coast of the Island, and is soon to visit the virgin forests of the interior.

HEREAFTER the Prussian state railways will, on the presentation of a certificate, convey at reduced rates the sick poor who have been sent to the various baths and therapeutic establishments.

A PATENT has been taken in Cuba for manufacturing soap from the dregs of molasses. The soap is said to be fit for domestic uses, and cheaper than the lowest grades previously imported.

THE dome of the colossal Palais de Justice, Brussels, now nearly completed, will be of *papier-maché*, and will weigh about sixteen tons.

A CORRESPONDENT of the *Druggist's Circular* writes that after having lost several yards of oiled silk, owing to the tissue sticking together, he was advised to dust it well with lycopodium powder before rolling it, and found the device to answer remarkably well.

Medicine and Pharmacy.

KOCH'S THEORY OF TUBERCULOSIS.

The medical journals on both sides of the Atlantic are just now full of references to the parasitic theory of the origin of tubercular disease recently promulgated by Professor Koch, the director of pathological investigations in the office of the Imperial Board of Health at Berlin, already well known by his researches on splenic fever and wound infection. For some time past he has been engaged in studying the conditions in which tubercular diseases in men and animals are propagated, and the results which he publishes appear to be accepted by many competent critics as conclusive in regard to this most momentous problem. Tubercular diseases are said to occasion one seventh of the deaths of the human family; a scientific knowledge of their cause can hardly fail to bring about an improvement in the method of their treatment, if the possibility of completely triumphing over them should be too wild a hope.

Koch finds in all tuberculous matter a minute rod-shaped parasite, to which he has traced the disease. The method of demonstrating the existence of these peculiar tubercle bacilli is of great interest. A piece of tuberculous matter, or a thin layer of the fluid of the tissues, is coated over a cover-glass, which is then dried and warmed so as to render it insoluble. The glass is then left for 24 hours in a solution of 1 cc. of a concentrated alcoholic solution of methyline blue, .2 cc. of a 10 per cent. solution of potash, and 200 cc. of distilled water. The preparation is thereby colored blue. The application of a few drops of an aqueous solution of vesuvin discharges the blue color from all the organic matter except from the tuberculous bacilli. This remarkable characteristic, according to Koch, occurs only, as far as he knows, in the case of the bacilli of tubercle and leprosy. All other bacteria and micrococci are changed to brown by vesuvin.

Koch claims to have proved by numerous experiments — and his observations have already been confirmed by Dr. Baumgarten — that these peculiar bacilli are invariably present wherever there is tuberculous matter. The question then arises, Are they the causes of the morbific surroundings, or are the latter the cause of them? This question Koch claims to have answered by patient investigation. On this point we may quote from the clear summary of his account given by Professor Tyndall in the London *Times* of April 22d: —

To meet the objection that it was not the parasite itself, but some virus in which it was imbedded in the diseased organ, that was the real contagium, he cultivated his bacilli artificially, for long periods of time and through many successive generations. With a speck of matter, for example, from a tuberculous human lung, he infected a substance prepared, after much trial, by himself, with the view of affording nutriment to the parasite. Here he permitted it to grow and multiply. From this new generation he took a minute sample, and infected therewith fresh nutritive matter, thus producing another brood. Generation after generation of bacilli were developed in this way, without the intervention of disease. At the end of the process, which sometimes embraced successive cultivations extending over half a year, the purified bacilli were introduced into the circulation of healthy animals of various kinds. In every case inoculation was followed by the reproduction and spread of the parasite and the generation of the original disease.

Guinea-pigs, cats, rabbits, rats, mice, and other animals were thus experimented upon. At first they were inoculated in the abdomen; afterwards a speck of bacillus-culture, obtained originally from a diseased lung, and purified by perhaps half a dozen generations, was placed in the aqueous humor of the eye, always with the result of inducing tubercular disease in the animals so treated.

Koch asserts that these bacilli are invariably found in the sputum of phthisical patients, and that the dried sputum will produce tubercle when inhaled. Guinea-pigs infected with expectorated matter which had been kept dry for two, four, and eight weeks respectively were smitten with tubercular disease quite as virulent as that produced by fresh expectoration. If this be true, there is obviously grave danger in breathing air in which particles of the dried sputa of consumptive patients mingles with dust of other kinds.

Although Tyndall says that Koch's experiments "leave no opening for doubting the correctness of his conclusions," and although this is the opinion of not a few medical men, there are others who believe that the question requires longer and more careful investigation before it can be considered as settled; and this, we must confess, is the view that we are inclined to take. The whole subject is likely now to be thoroughly studied and discussed, and we shall "report progress" as the investigation goes on.

THE SUMMER MEDICINE CHEST.

The following excellent hints on this subject, from Miss E. R. Scovil's contributions to the *Christian Union*, will form an appropriate supplement to the first article in our editorial columns, especially for mothers, to whom many of the suggestions will be useful at all seasons of the year, and at home as well as away from home: —

No one leaving home to spend the summer in the country should go without a few simple remedies; they may be the means of preventing a great deal of suffering, if not loss of life. A doctor is not always to be had the moment he is wanted, and if he were there are a great many cases which the mother could treat as well as he if she had the proper medicines. "A stitch in time saves nine" in mending the body as well as its habiliments, and the time consumed in getting what is necessary from a distant apothecary's shop may make the rent so large that it is beyond repair.

A stout wooden box should be got, about ten inches long, six wide, and six high, and divided into compartments large enough to hold a two-ounce bottle, leaving a space at one end for bandages, old linen, cotton-wool, etc. An extra supply of these may be taken, but some should always be kept in the medicine chest, that they may be forthcoming at a moment's notice. The box should be fastened with a button or hook, not with a lock and key, as the latter would certainly be missing in an emergency. It can be kept in a closet or on a high shelf, out of the reach of children, and no one else is likely to meddle with it.

It will hold twelve bottles, and these should be filled with castor-oil, paregoric, chalk mixture, peppermint, extract of ginger, ipecac, Wyeth's soda mint pills and compressed Dover pills (five grains), extract of witch-hazel, carbolic acid, glycerine and bicarbonate of soda. To these should be added a tin box of cosmoline, a roll of Seabury and Johnson's salicylated plaster, a bottle of flexible collodion, a tin case of prepared mustard plasters, and two short glass tubes, one bent, the other straight.

With this equipment any woman of ordinary common sense can carry her children through the summer without having recourse to a doctor. An india-rubber hot-water bag, holding three pints or two quarts, will be found a great comfort, as it is not always easy to get a bottle, or, if that is procured, to find a cork to fit it. They cost about two dollars each. If this is thought too great an expense it is a good plan to take as a substitute three or four empty lager-beer bottles. The metal fastenings, being attached to the bottles, are always in place when wanted. They can be filled with very hot water without breaking them, if, during the process, they are wrapped in cloths wrung out of cold water.

The mere mention of castor-oil is enough to make a child weep with anguish who has once taken it as it is ordinarily given. If a little milk is poured in a cup, a teaspoonful of essence of peppermint added, the oil put in last, the whole stirred and taken through a glass tube, the nauseous taste is effectually disguised. As a boy remarked after swallowing the compound, not knowing what it was, "It tastes a little like custard." A few drops of paregoric mixed with glycerine makes a soothing cough mixture. From twenty drops to a teasponful, according to the age of the patient, will check diarrhœa. If this is insufficient a dose of chalk mixture will usually be effectual. A little extract of ginger mixed with hot water and sugar will counteract the bad effects of a wetting. Ipecac must be on hand in case of croup, or to loosen an obstinate cough. Soda mint pills are excellent to correct a slight acidity, or to relieve nausea. Each compound Dover pill contains half a grain of opium and may be given in severe pain, or in conjunction with a hot foot-bath and hot lemonade to assist in producing perspiration and warding off a cold.

In case of a sprain or a bruise, after it has been well bathed with extremely hot water, the extract of witch-hazel heated, poured on flannel, and bound on the part will relieve the pain as quickly as if it really possessed magical properties. Carbolic acid diluted with warm water and poured into the ear is a sovereign cure for earache. The mother whose child suffers from toothache must find a corner in the medicine chest for a vial of powdered alum saturated with sweet spirits of nitre. This mixture put in the cavity, if there is one, or rubbed on the gum, if there is not, will give immediate ease. Bicarbonate of soda is for use in case of burns or scalds. It should be wet and bound on the place with a soft linen cloth. Cosmoline is soothing when the skin is broken, and keeps better than ordinary salve. The plaster will come in play for cuts, and a little collodion brushed over it makes it waterproof so that it need not be disturbed until the new skin has formed beneath it. The prepared mustard plasters need only wetting before being applied, and save the trouble of the home-made poultice. The straight glass tube is for administering castor-oil, and the bent one may be found very useful, as liquids can be taken through it without raising the head.

Bandages can be made by tearing a sheet into narrow strips, rolling each one tightly and fastening the end with a pin. Old linen does not mean worn-out shirt fronts, but soft pieces of tablecloths, napkins, or cambric handkerchiefs. A little cotton-wool should be taken for ear and toothaches, and may be packed between the bottles to fill up chinks in the summer medicine chest.

ANTI-FAT DIETARY.

Our corpulent friends may be interested in the report of Mr. Joseph Harrass's attempts to get rid of his superfluous burden of flesh, especially as the dietary followed does not seem, on the face of it, to be an objectionable one, and has not proved injurious to health in his case. The facts are stated in the *Herald of Health* as follows: —

He was corpulent, had irregular and feeble action of the heart, tendency to fainting, difficulty of breathing, and many disagreeable sensations in the head indicative of nervous exhaustion. Height, five feet six inches; normal weight, 150 lbs.; age, fifty-nine; weight at beginning of treatment, 200 lbs. Began treatment October 8th. Treatment as follows:—

Breakfast — Vegetables, brown bread (toasted), water, with lemon juice, and occasionally oatmeal.

Dinner — Vegetables, brown bread, water, and plain pudding.

Supper — Brown bread (toasted), stewed fruit, and water.

No tea, coffee, cocoa, or milk, except skimmed, and only a trifle of butter.

Result: —

End of October weighed	187	lbs.
" November weighed	182	"
" December weighed	177	"
" January weighed	174	"
" February weighed	173	"
" March weighed	170	"
" April weighed	168	"
" May weighed	166	"
" June weighed	166	"
Present weight	150	"

All the distressing symptoms have been relieved, and the patient is so well he can again carry on his business. His physical and mental strength have been greatly increased.

Mr. Harrass says he has suffered no serious discomfort from his diet, except when away from home, and he feels as if he had learned an important lesson as to how to reduce his corpulence — which has been such a source of discomfort — and once more enjoy life.

MEDICAL STUDY AT VIENNA.

Dr. Oppenheimer, commenting in the *Louisville Medical News* upon exaggerated statements which he has seen in regard to the expense of medical study at Vienna, adds the following as the results of his own experience during a year and a half in the Austrian capital:—

Living is dearer in any part of Europe than it is in the United States, as far as the necessaries of life are concerned, but still the student may live comfortably at Vienna, and pay for from eight to ten classes (or sometimes private courses, which are well worth the extra payment) for $60 per month. This implies that he is at Vienna for work, but still allows of his visiting theatres, concerts, etc., which there are cheap. The study of medicine there is altogether by the bedside, for which Vienna offers unrivalled advantages. In the obstetric wards, from twenty-five to thirty deliveries may be seen in the twenty-four hours, and students are allowed to remain in the wards during the night. In the gynæcological wards some interesting operation may be witnessed almost every day. Billroth's clinic is well attended by male and female doctors, and considerable work is accomplished every morning. A marked feature is that members of the class are called in alphabetical order to perform minor operations or to assist in major ones. Billroth has between ten and fourteen official assistants. The writer has seen eleven assisting at one time in a case of ovariotomy. Wells, Keith, Thornton, and Bantock require only three, and there is far less fuss and turmoil besides. Wölfler, Billroth's first assistant, bids fair to follow in his master's shoes. He is a bold and skilful operator. His private course will be found almost indispensable to the ambitious student.

SUMMER DRINKS.

The following are selected from a long list in *The Confectioner*: —

Corn Beer. — 5 gals. water; 2 qts. molasses; 1 qt. sound corn. Put all into a keg and shake well; in a few days a fermentation will have been brought on as nicely as with yeast. Keep it bunged tight. It may be flavored with oil of lemon, etc. The corn will last five or six makings. If it gets too sour, add more molasses and water in the above proportions. This drink is cheap, healthy, and there is no better with yeast.

Cream Soda without a Fountain. — 4 lbs. coffee sugar; 3 nutmegs, grated; 3 pts. water; whites of 10 eggs, well beaten; 2 ozs. oil lemon, or the equivalent of extract, or other flavor to suit; 1 oz. gum arabic. Mix; place over a gentle fire, stirring well; remove, strain, and divide into two parts. Into one part put 8 ozs. bicarbonate of soda; into the other 6 ozs. tartaric acid, shaking well. When cold, pour three or four spoonfuls from each into separate tumblers, one third full of water; stir and pour together.

Ginger Ale. — Put 4 gals. of clear soft water into a clean cask or earthenware pan, with a wooden tap inserted about an inch from the bottom; mix with this about 6 ozs. of bicarbonate of soda, and allow it to stand 12 hours to settle; draw it carefully off into another tub by means of the tap, but do not disturb the sediment which settles to the bottom of the first tub. Mix with this quantity 2 lbs. of loaf sugar, stirring until the sugar is dissolved; flavor with the extract of ginger ale; color with burnt sugar, etc.; fill glass lemonade bottles with the usual quantity, adding to each bottle 2 scruples of crystal tartaric acid; drive in the cork immediately, and tie it down with wire in the usual way; in an hour, or as soon as the acid is dissolved, the ale is ready for use, and will open with a sharp report.

Ginger Beer (1). — Crush 12 ozs. of the best ginger, and put it in a large tub; boil 8 gals. of water, and pour thereon; add 5 lbs. best white sugar, 1 oz. cream of tartar, and 1 oz. tartaric acid; stir the whole up with a stick until the sugar is dissolved; allow it to stand till milk-warm, then add 1 gill brewers' yeast; stir this in; let it stand for twelve hours, or until a scum forms on the top, then drain it off; clear by means of a tap about an inch from the bottom of the tub; whisk the white of an egg to a froth, and mix it with a teaspoonful of the essence of lemon; strain through a flannel cloth; bottle and tie down.

Ginger Beer (2). — 5 gals. water; ½ oz. tartaric acid; 4 lemons, sliced thin; 12 ozs. ginger; ¾ oz. cream tartar; whites of 2 eggs; ½ oz. compressed yeast; 5 lbs. sugar. Proceed as for ginger beer (1).

Ginger Beer (3). — 8 gals. boiling water; 5 lbs. of best white sugar; ½ oz. cream tartar; white of egg beaten to a froth; ½ lb. best ginger; 2 ozs. tartaric acid; 1 teaspoonful essence lemon; 1 gill brewers' yeast. Leave to work twenty-four hours before bottling.

Hop Beer. — 4 lbs. sugar; water q. s.; 6 ozs. hops; 4 ozs. ginger, bruised. Boil the hops for three hours with 5 quarts of water, then strain; add 5 quarts more of water and the ginger; boil a little longer, again strain, add the sugar, and when lukewarm add 1 pint of yeast. After twenty-four hours it will be ready for bottling.

Lemon Beer. — 1 lb. sugar; 1 lemon sliced; 1 teacupful yeast; 1 gal. boiling water; 1 oz. ginger, bruised. Let it stand twelve to twenty hours, after which it may be bottled.

Mead (*Metheglin*). — 10 gals. water; 2 lemons, cut in slices; 2 gals. honey; a handful dried ginger root; mix all these, and boil one half hour, carefully skimming all the time; while boiling, add 2 ozs. hops; remove from the fire, and while the liquid is lukewarm add a strong yeast, and put into a cask to work for about three weeks, when it is fit for use.

Mead. — 1 gal. water; 3 lbs. strained honey; boil about a half hour, adding ½ oz. hops; skim carefully, and drain the skimmings through a hair sieve, returning what runs through; remove from the fire, and when the liquid is lukewarm stir into it ½ pt. yeast, which is sufficient for 9 gals. mead; put into a cask and let it work over, filling it up until fermentation subsides; put a strong paper over the bung-hole. This mead may be flavored with spices while boiling, and makes a delicious summer drink.

MISCELLANEA MEDICA.

Former Mortality from Smallpox in Philadelphia. — In looking over some old books we observed a record of the deaths by smallpox in Philadelphia long prior to the introduction of vaccination. In 1731 the deaths were 490, and in the seven years, 1738 to 1744, the number was 3179, — an average of 454 yearly. It must be considered that the population of the city at that period must have been less than 20,000. The record gives the number of taxables in 1740 as 5000, — a figure that would represent less than 20,000 individuals. Suppose for a moment that the disease should prevail with equal fatality in San Francisco at the present time, — the population being at least twelve times that of Philadelphia in 1740, — we should have 6000 deaths in a year, or 42,000 in seven successive years. In other words, the deaths from smallpox alone would far outnumber the present mortality from all causes combined. These statistics appear almost incredible, yet they belong to that class of figures that do not lie. What else than vaccination makes the difference? How can this argument be evaded?

Immunity of the Chinese from Disease. — The Medical Officer of the State Board of Health of San Francisco has given his testimony as to the effects of residence among the Chinese, which has been laid before the Congress. He states that he never knew any disease or pestilence originating or spreading in the Chinese quarter. He admits that the Chinese live quite close, and attributes their healthy condition and immunity from disease to their frugal life. "They eat," he says, "only what is necessary to live upon. They eat to live, and do not live to eat. They are clean in their habits, and they drink no whiskey. I have never seen a drunken Chinaman in my life. They consequently obtain a better resisting power to the attack of disease. They constantly wash themselves, and keep themselves and their clothes clean. The death-rate is greater among the whites than among the Chinese, — greater with adult white people than with adult Chinamen. There have been no epidemics among them, and there has been less smallpox among them than among the whites, the ratio of population being allowed."

Sea Bathing Good for the Eyes. — Dr. Amat says that sea bathing "has proved of great benefit in many cases of disease of the eye. The improvement appears to be due to two causes: (1.) The influence which such a course has upon the general health, by curing anæmia and elevating the tone of the system, since sea bathing is in the highest degree restorative. (2.) Sea water, and occasionally, also, the atmosphere of the sea, has a local irritant action which should be watched, since it is most serviceable when there is a chronic, torpid, and indolent inflammation, while it is exceedingly

dangerous when the inflammation is of the acute kind."

RELIGION AS A THERAPEUTIC HELP. — It is not often that scientific men enroll religion among therapeutic agencies. Dr. Stephen S. Alford, however, in an article on the "Practical Treatment of Dipsomania," does this. After recommending total removal of alcohol from the patient in acute attacks, with substitution of bromides, capsicum, Russian baths, acidulated drinks, diluent foods, etc., he advises tonics and a gradual education of the moral strength. He says: "Religious influence is important in the second and subsequent stages of treatment, and to sustain the abstinence that must be religiously observed under all circumstances throughout life. This conquest of self, and keeping the morbid craving in subjection, few men can accomplish. At times, even after years of abstinence, the desire will be most distressing and overpowering. It is refreshing, under such circumstances, to recognize and experience the existence of a Higher Power, who will give the necessary help to all who really believe in it and ask for it."

HEAVY FINE FOR A FAULTY DIAGNOSIS. — Dr. Hans Hebra, lecturing on a case of prurigo, observes that in the Austrian army prurigo exempts from service, which scabies does not. A military medical officer, examining a soldier who was discharged from hospital, did not distinguish between the two forms of artificial eczema, that of prurigo and that of scabies, and the man seeming quite well, he gave him a certificate for service, thinking that the traces of skin disease, which were visible, were due to scabies. When the soldier was exposed to the hardships of a campaign, the noise he made at night with scratching was insufferable to the other soldiers, and when he ought to have been firing on the field of battle he fell to scratching himself. He was sent to a hospital, and soon got well enough to return to his regiment; but the prurigo soon recurring, he was sent back to Vienna, and, on being inspected there, was exempted from duty on account of the nature of his affection. But the army surgeon was held responsible for all the expense which the state had incurred in transporting, feeding, and clothing the man during the time he was in the army, and this amounted to 300 or 400 florins. Supposing a recruiting surgeon examines 600 or 700 men daily, his risk of decimating his pay is thus very considerable.

ANTISEPTIC USE OF BORAX. — In relation to the recommendations which have been made of employing borax as an antiseptic, Dr. Atkins states that for eight years past he has treated all cases of erysipelas by means of a solution of borax in glycerine (one drachm to the ounce), well rubbed into the skin, and applied on linen. In every case it has seemed to cut short the disease promptly, the characteristic appearances beginning to fade in a few hours. Sometimes tincture of iron was given internally, sometimes not. Dr. Atkins has also frequently used borax ointment in the treatment of suppurating sores, the results of cuts, burns, bruises, etc. The strength of the ointment is immaterial, so long as there is plenty of borax in it. In these cases the suppuration is usually checked at once, the redness rapidly paling away. In minor cases it seems quite equal to carbolic acid.

IS VICHY WATER A LUXURY? — According to the London *Chemist and Druggist*, the Vichy Waters Company and the authorities of the city of Marseilles have had a curious difference. The latter had such a high opinion of the delightfulness of Vichy water as a beverage that they classed it as a luxury, and claimed an octroi duty of five francs per hectoliter. The company, on the other hand, repudiated the flattering suggestion, and declared that their products had no other than medicinal attractions. Their counsel before the court read a letter from Madame de Sevigné, who said Vichy water was very nasty and made her sick. The judges did not venture to taste the waters for themselves, but found for the Vichy Company, and ordered the city to disgorge the duty they had illegally charged.

PEPSINE IN SEA-SICKNESS. — A German authority says that pepsine has proved quite successful in warding off sea-sickness. As much pepsine as will lie on the point of a knife is dissolved in a wineglassful of water containing 5 drops of hydrochloric acid. This dose is taken three times a day, and especially if feelings of sea-sickness threaten.

SELECT FORMULÆ.

ALKALINE DRAUGHTS. — Where an alkaline drink is indicated the following will be found agreeable: —

℞ Bismuthi carbonat.,	
Magnesiæ carbonat.	āā grs. 10

Make a powder to be taken in half a bottle of soda water three times a day.

Or: —

℞ Bismuthi subnitrat.	grs. 15
Sodæ bicarbonat.	grs. 22
Pulv. tragacanthæ co.	grs. 62

Make a powder to be taken twice or thrice in 24 hours in a wineglassful of brandy and water.

PILLS FOR DYSPEPSIA. — The following is from good authority: —

Diastase	10 grains.
Pepsine	50 "
Extract of gentian	50 "
Tartaric acid	50 "
Powdered rhubarb	50 "
Gentian	q. s.

Divide into three-grain pills, and silver, if desired. Dose, two to three pills, shortly before meals.

DIARRHŒA REMEDY. — Professor William Thomson, of the University of the City of New York, recommends the following as a remedy for diarrhœa: —

℞ Plumbi acetatis . . .	gr. xvi., or 1.06 gram.
Pulv. camphoræ . . .	gr. xij., or 0.72 "
Pulv. opii	gr. iij., or 0.18 "
Bismuth. subcarb. . . .	gr. xij., or 0.72 "
Ext. gentian	q. s.

Make into twelve pills. Dose, one pill every hour to three hours, according to severity of disease.

FOR CORNS. — Make a mixture of —

Carbolic acid	1 part.
Distilled water	10 parts.
Glycerine	10 "
Soap liniment	10 "

Apply by means of a piece of cloth or lint, and cover it well with sheet-rubber, so that no evaporation may take place. The corn may be soon detached, often on the following morning. Inflamed and swelled bunions may be treated in the same manner, but, in place of the above mixture, another should be applied, composed of dilute solution of subacetate of lead, to which may be added, if desirable, some preparation of opium.

COD-LIVER OIL JELLY. — This can easily be prepared in the following manner: —

Cod-liver oil	5 fluid ounces.
Best isinglass	2 drachms.
Sugar (white), powdered . .	1½ ounces.
Oil of bitter almonds . .	4 drops.
" allspice	2 "
" cinnamon (Ceylon) .	4 "
Water	1 fluid ounce.

Having placed the cod-liver oil, isinglass, and water in a suitable vessel over a water-bath, apply sufficient heat to melt the isinglass; then add the sugar, the essential oils having been mixed with it by trituration, and remove from the fire, stirring the mixture as it cools until it thickens. When it is cold a firm jelly will result, which will keep without spoiling for any length of time, if put up in corked bottles. The consistence of this jelly is such that it may be taken in water, milk, or wine without tasting the oil.

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Special Notices.

Massachusetts Medical Society.

THE annual meeting of the Massachusetts Medical Society was held in this city on June 13th and 14th.

An unusually large attendance was present, partly owing, perhaps, to the discussion of the important question in regard to the admission of women as members of the Society. The subject was ably discussed, and the general feeling seemed to be that, for the present, at least, matters should remain as they were.

The reports of the various officers showed the Society to be in the most flourishing condition. Dr. Alfred Hosmer, of Watertown, was chosen President for the ensuing year.

GOOD WORDS FOR ADVERTISERS.

WE desire to call the attention of our readers to Billings, Clapp & Co.'s *Bark and Iron*, a most valuable remedy for loss of appetite and dyspepsia. Clergymen, lawyers, and all those of sedentary habits who are liable to nervous prostration will find it a most excellent and agreeable tonic.

HORSFORD'S ACID PHOSPHATE IN HEADACHE. — PARIS, Ill., *January* 27, 1880. — I used the sample of Acid Phosphate, and have prescribed it several times. In certain forms of Headache, it seems to act as a specific. A friend of mine took a bottle with her on a Niagara excursion, last summer, she being subject to headache from riding on the railroad. She gave it to several of the company who had headache, to their great relief. No doubt it is valuable in many forms of dyspepsia also.

J. L. HAYS, M. D.

LOUISVILLE, KENTUCKY, *April* 24, 1882.

CELERINA is a combination of drugs which meets all the requirements of a first-class prescription: it is efficient, agreeable, and safe.

I have used it in two cases of neurasthenia, with highly satisfactory results, and shall give it still further trial.

Yours very respectfully, H. A. COTTELL, M. D.,
Demonstrator of Anatomy, Microscopy, and Medical Chemistry, University of Louisville, Medical Department.

HEALY'S VEGETABLE TONIC CORDIAL is an unsurpassed alterative for the blood, and a valuable spring tonic for women.

CEPHALINE fills a demand never before met. It is a safe and certain cure for Headaches and Nervousness.

THE invention of steel pens is claimed by Johann Janssen in Aix-la-Chapelle, in 1748, who little dreamed of the perfection and profusion of their manufacture in the succeeding century. Try Esterbrook's.

GOOD WORDS FROM SUBSCRIBERS.

Have taken the JOURNAL OF CHEMISTRY sixteen years, I believe. Am much pleased with it. Find much in it which is new to those with whom I converse, — both new and valuable

WM. P. HYDE.

SANTA CLARA, CAL.

I cannot do without the JOURNAL; it is a favorite in my house. Respectfully, GEORGE D. NORRIS.

NEW MARKET, ALA.

NEW BRITAIN, CONN., *Dec.* 24, 1881.

I have been a reader of the JOURNAL OF CHEMISTRY from the first, and value it very highly. HENRY E. SAWYER.

Boston Journal of Chemistry
AND
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Familiar Science.

HYDROGEN DIOXIDE.

No more striking illustration could be given the remarkable dissimilarity of substances ade up of the same chemical elements in slight- different proportions than the two compounds hydrogen and oxygen. One of these, repre- ted by the formula H_2O, is water, the proper- s of which are familiar to everybody. The er, known as hydrogen dioxide, or peroxide, O_2, differs in its composition from the first ly in containing twice as much oxygen; but its properties it is as unlike water as could ll be imagined, while, instead of being one of most common of substances, it is a rarity l a curiosity, except in the laboratory of the emist. It is a colorless, oily liquid, about one lf heavier than water, without smell, but with itter, astringent taste. Pour a little of it on ur hand, and it blisters the skin, with a good l of irritation. In contact with finely divided tals, it is decomposed with almost explosive lence into water and oxygen. One of its ms of oxygen is, indeed, very loosely united, l is readily given up to substances that have a onger affinity for that element. In other rds, it is a powerful oxidizing agent.

This curious compound was discovered in 18, by Thenard, who obtained it by the action muriatic acid on barium dioxide. It is still de in much the same way, sulphuric acid be- generally used in place of muriatic.

Soon after it was discovered, chemists pre- ted that the "oxygenized water," as it was lled, would come to be of importance in the lustrial arts. As early as 1830 it was used cleaning discolored oil paintings. The dis- coloration arose, in most cases, from the formation of the dark sulphide of lead by the action of sulphur on the white lead in the paints; and this dark compound was changed into white sulphate of lead by the oxidizing action of the hydrogen dioxide. More recently, it has been used for bleaching the stained paper of old engravings, and for changing the color of dark hair to a golden tint; and within a few years attempts have been made to utilize it on a larger scale for the bleaching of linen and other textile fabrics.

In the primitive "grass bleaching," the chemical process is the same; that is, it is a decomposition of the coloring substances by oxidation, or the union of oxygen with the hydrogen which is one of their essential elements. The oxygen of the air, under the influence of sunlight, is here the agent that does the work. The method is a slow and inconvenient one, and impracticable in many localities.

Chemistry has at its disposal many oxidizing agents which can be employed instead of atmospheric air, but all of them have the disadvantage of attacking and injuring the fibre to be bleached. They must be used cautiously to prevent serious mischief to the fabric, and even with the utmost care a slight sacrifice of its strength is inevitable. The hydrogen dioxide is the one agent that does not act in this way, and the only obstacle in the way of its general use for bleaching has been the difficulty of preparing it in a form suitable for use, at moderate cost. Until recently it has not been possible to obtain it on the commercial scale, except of uncertain and variable composition, and more or less charged with impurities. Now, if we may trust the reports in German industrial journals, these difficulties are overcome, and hydrogen dioxide can be got "in watery solutions of from three to ten per cent., in a uniform, chemically pure state, at low prices and in large quantities." If this is true, it must soon supersede all other means of bleaching, and add to the list of chemical compounds that, from being mere curiosities of the laboratory, have come to be familiar to the world as important industrial agencies.

BEGINNINGS OF ELECTRIC TELEGRAPHY.

AT a lecture delivered not long ago in Paris by the Count du Moncel, the actual instruments were shown with which, in 1809, Professor Sömmering of Munich was able, by the use of twenty-six wires, to send intelligible messages a distance of nearly a mile. The wires were immersed in water, and over each was marked a letter of the German alphabet, one being left for the return current. By means of a voltaic cell a feeble chemical action could be excited at the end of any given wire, and the bubbles of gas from the decomposition of water about it indicated what letter was intended. Another primitive telegraphic apparatus, of which some fragments were shown, was that of Francis Ronalds, who employed frictional electricity from a common plate machine. At each end of his line, which was three miles long, was placed a dial, marked on the circumference with the characters of the alphabet, and moved at a uniform speed of clockwork. The operator at either end, to send a message, had only to watch the dial, and when the letter which he needed appeared at the proper point, by making connection with the charged conductor of the plate machine, a spark was instantaneously transmitted to the extremity of the wire, making known to the other, who kept watch of his own dial, the letter intended. This system differed very little from some which are still in use, except by the employment of electricity of high tension, instead of the voltaic current; but its value was so far from being appreciated that when Ronalds offered to establish a naval telegraph between London and Portsmouth, the Admiralty replied that "it had no use for communication of that kind."

HEALTH, COMFORT, AND DRESS.

DURING the torturing days of summer, when the heat without conspires with the heat within to make clothing a burden and life a penance, who has not longed for the shade of a primeval forest and the simplicity of aboriginal dress? We are tempted to inquire, What has civilization done to make the heat of summer less oppressive? As we look at the dress of the man, or even of the woman, of the day, we fail to note any marked difference between the costume of January and that of August. It is true that wraps and ulsters are laid aside, but this is about all that strikes the eye. The perspiring doctor rushes around from the bed of the sick to the couch of the dying, arrayed in his sable suit of black. The minister and the lawyer hardly venture to lay aside the stove-pipe hat, while an invulnerable breastplate of starch and cellulose keeps out every breath of air. Here and there a business man dares to don a straw hat without a brim deserving the name, at the risk of his nose and complexion, to say nothing of comfort. Here at least the fair sex have the advantage, for their light straw hats protect the eyes and face. But they too must suffer from the heat sometimes, for, although their summer dresses *look* light and thin, they are a delusion; for the airy grenadines are made up over air-tight silks, and linings compensate for other deficiencies.

One of the signs of advanced civilization is discomfort in dress: the farther any nation advances in civilization, the more she tortures her subjects, and, strangely enough, this infliction generally falls upon the so-called upper class. The educated class, the members of the liberal professions, the denizens of the city, the merchant and his clerks, suffer more than the poor laborer from heat, if not from cold. As between the sexes, there is little difference in this respect. Civilization even extends its cruel hand over the

babe in its cradle, and would afflict the dead if they had any feelings left.

In bringing these charges against the arch tyrant, we speak not of fashion, whose cruelest dictates are obeyed with pleasure by her blind disciples, but only of those discomforts inflicted under the name of decency and decorum. It is customary to ridicule the high-heeled boots and expansive crinoline worn by women, when the actual discomfort they cause is less than that imposed on men in hot weather by a high shirt collar; and yet where is the man who dares to show himself to his fellow-men without a collar?

Science has investigated the absorbent and radiant power of different fibres and different colors, but man, in his wisdom, disregards this, and prefers the worst instead of the best. Woman may expose her brain to the direct rays of the sun by wearing a small, useless bonnet, but fashion compels her to carry a parasol to compensate for it. On the other hand, fashion, not so cruel as she is painted, is equally in favor of large hats with *useful* brims. Not so with men. Broad brims are tabooed, and parasols are not permissible. With regard to the neck, man has no choice; a collar he *must* wear, and one fitting close to the neck, and reinforced by a cravat or tie. To woman alone is granted the comfort of low-necked, half-low, heart-shaped, or loose-fitting collars. The body, or trunk, is no better off. Man *must* wear a stiff white shirt, a vest, and a lined and padded coat. Woman need wear but one (visible) garment, which may be made as light and thin as is possible without being transparent. It is even doubtful whether the tightly drawn corset, that object of universal use which is so violently denounced by the opposite sex, causes more discomfort than the numerous articles with which man surrounds himself; for physiologists have learned that woman can breathe with the upper part of the lungs (thoracic breathing), and therefore suffers less from tight lacing than man. As regards the arm, matters are pretty evenly balanced, with the odds in favor of woman, who may shorten her sleeves as much as she pleases, and in no case wears more than one long-sleeved garment where a man wears three. Cuffs she may dispense with, but he cannot. Her sleeves need not be lined; his must, unless of very thick material.

Descending to the lower extremities, we find no resemblance, for here alone the garments of the sexes are totally unlike. Opinions differ as to whether pantaloons or petticoats are cooler, and at first sight comfort seems to favor the former; but persons who have worn both (and they alone are competent to judge) assure us that the contrary is the case. This is due to the fact that skirts, retained at a greater or less distance from the limbs by their own stiffness, or by the use of crinoline, permit of ventilation and free circulation of air not possible with tight pants or loose trousers, and only equalled by knee-breeches.

Of the feet we need not speak, for men's shoes and women's boots are now so nearly alike that it is difficult to distinguish them, and but for the size those of either sex might be worn by the other.

Advocates of "dress reform," who are trying to make women's dress more like men's, are invited to consider the above facts, and to remember that the dress of a "gentleman" is about as uncomfortable as if designed by the Evil One. It is the Western civilization of the nineteenth century that has developed this refinement of cruelty, compared with which pierced noses and lips and tattooed skin are most comfortable. The survival of the unfittest has led to its development, and now variations have ceased, so that there is no longer any chance for improvement or even change. H.

SUNSTROKE.

The New York City Board of Health has issued the following circular on the prevention of sunstroke, which we reprint for the benefit of our readers:—

Sunstroke is caused by excessive heat, and especially if the weather is "muggy." It is more apt to occur on the second, third, or fourth day of a heated term than on the first. Loss of sleep, worry, excitement, close sleeping-rooms, debility, abuse of stimulants, predispose to it. It is more apt to attack those working in the sun, and especially between the hours of eleven o'clock in the morning and four o'clock in the afternoon. On hot days wear thin clothing. Have as cool sleeping-rooms as possible. Avoid loss of sleep and all unnecessary fatigue. If working indoors and where there is artificial heat (laundries, etc.), see that the room is well ventilated.

If working in the sun, wear a light hat (not black, as it absorbs the heat), straw, etc., and put inside of it, on the head, a wet cloth or a large green leaf; frequently lift the hat from the head, and see that the cloth is wet. Do not check perspiration, but drink what water you need to keep it up, as perspiration prevents the body from being overheated. Have, whenever possible, an additional shade, as a thin umbrella when walking, a canvas or board cover when working in the sun. When much fatigued, do not go to work, but be excused from work, especially after eleven o'clock in the morning on very hot days, if the work is in the sun. If a feeling of fatigue, dizziness, headache, or exhaustion occurs, cease work immediately, lie down in a shady and cool place, apply cold cloths to and pour cold water over head and neck. If any one is overcome by the heat, send immediately for the nearest good physician. While waiting for the physician, give the person cool drinks of water or cold black tea or cold coffee, if able to swallow. If the skin is hot and dry, sponge with or pour cold water over the body and limbs, and apply to the head pounded ice wrapped in a towel or other cloth. If there is no ice at hand, keep a cold cloth on the head, and pour cold water on it, as well as on the body.

If the person is pale, very faint, and pulse feeble, let him inhale ammonia for a few seconds, or give him a teaspoonful of aromatic spirits of ammonia in two tablespoonfuls of water with a little sugar.

SELF-CARE WHILE NURSING THE SICK.

The following, from the *Christian Union*, is sensible advice, and, if we may judge by our own observations, likely to be needed by non-professional nurses, who often forget themselves in their devotion to those under their care:—

To those who are called upon to nurse the sick through a long and severe illness it is of the utmost importance, not only to themselves but to their patient, that their own health should be preserved and their own strength maintained not only throughout the critical stage, but during the period of convalescence, oftentimes so tediously prolonged. To all such we submit the following simple precautions to aid them in preserving their own health while nursing the sick:—

If the malady of the patient be such as to cause any marked odor of the breath or noticeable exhalations from the skin, take care always to sit on the side of the bed or sick person which is opposite to or away from the direction which the effluvia take toward the windows or draught of a fire-place. So so that their breath, etc., is carried away from you. Do not sit too close to them, or take their breath if you can avoid it.

To keep one's own strength in a case of prolonged care, and particularly if obliged to sit up all night for many nights in succession, great benefit will be derived from taking a warm bath early in the morning, and putting on fresh undergarments every second morning; or, if the disease be particularly infectious in its nature, it is best to change the underclothing every morning. It will be found that the warm bath, followed by brisk rubbing of the whole body with a coarse Turkish towel or flesh brush, will refresh the wearied body almost as much as sleep. At the same time keep up the appetite and strength by small doses of quinine, two to three grains three times a day, and nourishing diet, with perhaps a little wine and water occasionally.

HOW TO MAKE A BOUQUET.

The following practical lesson on this subject is from the pen of "an artist" who sends it to a London horticultural journal:—

Take first a mass of white, it may be a truss of white geranium, a double white stock, or a clematis; or, for a small bouquet, a bunch of the small double pyrethrum; then scarlet, which to an artist means orange; as, for instance, a double scarlet geranium, Tom Thumb nasturtium, or any brilliant orange, though that color is not so abundant as it ought to be; put any of these next the white on one side of it; then take red, a bright rose, and the brighter the red the nearer it should be to the white, so that other duller reds may be beyond it (by red is meant all colors of crimson, but red is the true description); place these on the other side of the white. Some very dark, almost black, flower may be brought near the white, but only a very little of the color, and beyond the scarlet a very little of blue, such as that of an Emperor William pansy, or a little sprig of lobelia. Beyond the red have purple and yellow brought together, and on the other side picotees, which, although rich in color, are not prominent, though any flowers that have broken colors will do; beyond these again bring in blue in small mass and your taller flowers, as pentstemons (the blue kind make an admirable background, and are always to be had), dark-colored fuchsias (some fuchsias, or leaves of a brownish hue should interpose beyond the blue), and the last to introduce should be maidenhair fern, which certainly makes at all times a very pretty background. Make this bouquet in your hand, and avoid too much formality. All colors will generally arrange themselves with sufficient effect and force, though they may interfere a little. A bouquet has generally only one side, in which case it should slope gently upwards, and the white should come near the bottom. If it is to be seen all round, the white should be in the centre with the above arrangement of colors in mass round the white. When your bouquet is nearly enough, tie it round in the middle of the stems, cut them off evenly, and drop it into a vase of water. Two principles may be followed in making a bouquet, — one harmony and contrast of color, the other force of light and shade; whichever is adopted to begin with, pure white is absolutely necessary, even if only composed of a single white flower, it should be the largest mass of the whole.

THE MICROSCOPE IN THE DETECTION OF FORGERY.

MR. JOHN ROGERS — not the old English martyr, but a modern English microscopist — has the following interesting paragraphs on this subject in a recent lecture: —

For the detection of forgery there is no expert equal to the microscope. The examination of handwriting with a view to determine its authorship, its genuineness, its age, and whether or not it has been altered from its original form and intent is one of the most recent uses of this instrument, and one the importance of which has but lately become known, and is even now not generally realized. In a recent case a microscopist established the date of a document by recognizing in the paper fibres only recently used in paper-making, which demonstrated that the paper was manufactured at a later date than that claimed by the writing upon it. Writing can scarcely be changed, after its original execution, so adroitly but that the microscope can detect the falsification. The face of the paper, when once marred by disturbing the position of the fibres, can never be restored, and hence scratching and erasure can be recognized, though performed with consummate skill. Inks, alike to the unaided eye, are marked under the lenses by conspicuous differences of shade, color, or density. Lines which look simple and honest may show themselves as retouched, or altered, by the same or by a different hand, or pen, or ink; and lines drawn upon new paper look different from those drawn after it is old. The microscope will give valuable information as to the relative age of superimposed, crossing, or touching lines, and state positively whether lines were written before or after related erasures, or scratchings, or foldings, or crumplings of the paper. If the signature has been constructed by tracing it with pencil lines over an original, and subsequently inking it with a pen, particles of plumbago can be somewhere detected. If copied or imitated originally in ink, the distribution of ink is peculiar and suggestive, indicating hesitation from uncertainty, or pauses to look at a copy, or to recall a style, or to decide on a future course, just at points where a person writing his own name would pass over the paper most rapidly and promptly.

There is no form of forgery so difficult to detect as that of the most cunning free-hand imitations done with practised skill; yet for this there is a test which is entirely and alone within the province of the microscope. A genuine signature is automatic; no close attention of the will is required, and there is a minute rhythm, caused by the action of the small muscles, in regulating the amount of pressure upon the pen; it is quite imperceptible to the naked eye, and cannot be accurately determined by a simple magnifier. These variations of pressure differ with individuals from 200 to 300 to the inch, and are as regular as they are spontaneous and involuntary. When a man writes naturally the pressure variations are rhythmical, while, on the contrary, when he is consciously imitating the writing of another, they are irregular and unsymmetrical. As a matter of microscopic analysis the hand always trembles, and must do while the heart beats and the nerve-impulses follow each other in rapid succession. In health this rhythm of progress is perfect and regular, but its regularity is broken by mental excitement and destroyed by voluntary effort. Now, forgery is impossible without one or both of these interfering agents.

SCIENTIFIC BREVITIES.

THE HYGIENE OF THE KEROSENE LAMP. — That valuable contrivance, the kerosene lamp, has been so prominently engaged in bursting and in blowing human beings into hospitals and eternity that many people are under the impression that it has no time in which to attend to anything else. This is a great mistake, and a convincing proof of its abilities in another direction is found in the announcement of the death by suffocation of a priest who had slept in a room in which a lamp was burning imperfectly. How many thousand headaches are discovered every morning in bed chambers that have been lighted through the night by kerosene lamps "turned down low" will never be known, but the aggregate is enormous, and cannot be otherwise; for a small flame in a lamp chimney does not cause enough draught to ensure perfect combustion, and this being the case the slumberers breathe carbon and carbonic acid gas as literally as if they stood over the chimney of a petroleum refinery. If a little light be necessary in a bed chamber, it may be supplied by a specially prepared taper, by a candle, or by a wick floating and supported in animal or vegetable oil; but the turned-down kerosene lamp is always a menace to health and life.

THE EFFECTS OF COLORED GLASS ON LIQUIDS. — A recent article in a German paper on the effect of the color of bottles on liquids, makes the statement that liquors contained in colorless bottles, when exposed for some time to the light, acquire a disagreeable taste, notwithstanding the fact that they may have been of superior quality before being so treated; liquors contained in brown or green bottles, however, remain unchanged in quality, even if exposed to direct sunlight. This phenomenon has not received proper attention heretofore, and quality has often been sacrificed for the sake of outward appearance. Since the results of the above treatment are due to the chemical action of light, it is advisable to use red, orange, yellow, green, or opaque bottles for the preservation of liquors, while colorless blue and violet ones should be entirely discarded.

EFFECTS OF INTELLECTUAL WORK ON THE BRAIN. — What are the effects of different kinds of intellectual work on the cerebral circulation? This question M. Gley, a French physiologist, has attempted to answer by experiments made upon himself. When he applied himself to a subject which he had a difficulty in understanding thoroughly, and had therefore to concentrate all his energies upon it, the rhythm of the heart was far more accelerated than when he took up some matter with which he was well acquainted.

RUSKIN ON THE ALPS. — "The longer I stayed among the Alps," says Ruskin, "and the more closely I examined them, the more I was struck by the one broad fact of there being a vast Alpine plateau, or mass of elevated land, upon which nearly all the highest peaks stood like children set upon a table, removed in most cases far back from the edge of the plateau, as if from fear of their falling; while the most majestic scenes in the Alps are produced, not so much by any violation of this law, as by one of the great peaks apparently having walked to the edge of the table to look over, and thus showing itself suddenly above the valley in its full height."

ABOUT CLOCKS. — In spite of the magnificence of the domestic arrangements of the ancients, and the refined care bestowed upon all that could make life agreeable, they were without many of the most ordinary conveniences. For instance, a clock to regulate time, to us an indispensable piece of furniture, which a man of the most moderate means can command, and even the poorest does not like to be without, was for nearly 500 years unknown in Rome, and even in later times only in a very imperfect state. According to Pliny, there were no sun-dials in Rome until 11 years before the war with Pyrrhus, although in Greece they were in use somewhat earlier, about 500 B. C. Water-clocks came into fashion later on; but there was no idea of accurate time-keeping, and in order to know the hour, without giving themselves any trouble, the patricians kept slaves for the express purpose of watching the dials and reporting each time the hour expired.

"THE LONGEST WAY 'ROUND." — "The longest way 'round is the shortest way home," is an old and somewhat obscure saying, often used to justify a long journey to cover a small distance. The following from an Indian paper very well illustrates one of the cases in which the proverb is applicable: "During the repairs of the telegraph cable near Bombay, the steamers Chiltern and Great Northern were about half a mile apart, the former having hold of a shore-end cable, and so in telegraphic communication with Bombay, the latter having hold of the sea-end, and so in telegraphic communication with Aden. The Chiltern desired the Great Northern to splice on to the cable end held by the latter and pay out three fourths of a mile of cable, and this was communicated by wire from the test-room of the Chiltern, passing through all the coils of cable in her hold and on to Bombay, whence it was sent on to Aden, and back from Aden to the Great Northern. Thus, as a speedy means of sending a message one half mile, it was forwarded by a route between 3000 and 4000 miles long. The following morning, when the vessels were within one fourth mile of each other, communications passed between them constantly in the same way."

A CHIMNEY WORTH SWEEPING. — A German journal gives the result of an experiment performed upon some soot, with which the inside surface of an old flue, pulled down during the late alterations at the Royal Mint at Berlin, was found to be thickly caked. This flue had served for many years as an outlet for the smoke given off by the furnaces in which the bullion undergoes fusion before its conversion into coinage; and it occurred to the architect superintending the repairs in question that it might be worth while to analyze the soot lining the chimney through which fumes of boiling gold and silver had passed in such quantities. The liquefaction of the less precious metal requires a temperature of 1000°, whilst that of gold cannot be effected under 1250°. It is usual to strew the surface of these metals, when in a liquid state, with charcoal, in order to hinder evaporation. But at such a fierce heat as that above indicated some evaporation is bound to take place, and its results were made manifest by the yield of four pounds' weight of pure gold, valued at something under four thousand marks ($1000), obtained from the soot that was scraped off the inside of the chimney in question.

MODE OF KILLING FISH. — M. Baule, writing in the *Journal de St. Malo*, explains why fish eaten in Holland are superior in taste to those eaten in France. The Dutch fishermen kill their fish as soon as taken from the water, by making a slight longitudinal incision under the tail with a very sharp instrument. The French fishermen, on the contrary, allow their fish to die slowly, and this slow death softens the tissues and renders them more liable to undergo change. No one, says M. Baule, would eat of a sheep or a fowl that had died a natural death or had been drowned, and why should we be less delicate with an animal that inhabits the water?

A SIMPLE ICE-COOLER. — An ice-cooler on a small scale, but one likely to be very useful in the sick-room, is described by Dr. Rand in the *Clinical Record*. It consists simply of a cylindrical case of thick paste-board, large enough to hold the tumbler loosely, over which slips an outer closed cylinder, with a button on top. Besides the badly conducting paste-board, there are two strata of included air, which are non-conducting.

BICARBONATE OF AMMONIA. — This ammonia salt is nearly fixed in ordinary air, but M. Melsens has observed (what he considers rather important from a chemical point of view) that it has the prop

erty of being very easily dissociated when it is moistened with a small quantity of water. Indeed, while it is otherwise very little odorous, if not wholly without odor, a little moistening makes it give, in a few seconds, a very strong smell of ammonia, and the salt loses much weight, under the influence of water, in a few hours (considerably more than it did in the unmoistened state).

Practical Chemistry and the Arts.

PROGRESS OF THE ELECTRIC RAILWAY.

We have no idea that electricity will supersede steam to any great extent on railways in our day and generation, but in certain localities where the smoke and cinders from the ordinary engines are specially objectionable, the new motive power will rapidly come into use. Already it is beginning to be utilized in such cases; as in the extensive linen-bleaching works of M. Duchesne-Fournet, at Le Breuil-en-Ange, in France, by the managing engineer, M. Dupuy. From the account in *La Nature* we learn that each piece of cloth is 100 meters long (say 333 feet), and about 37 acres of ground may be covered. M. Dupuy had long thought of constructing a railway with special mechanism for bringing in the cloth, but a steam-engine in a bleach-field is very objectionable on account of the smoke and cinders. The objection does not apply to electricity, and M. Dupuy has had a small line made along the meadows, crossing the ends of the lines of cloth, with a Siemens dynamo-electric machine and collecting apparatus in one vehicle, a set of Faure accumulators, giving the motor force, in another (the tender), and a series of trucks for the cloth. The line is 500 meters in length, and has twenty-one branches. The train goes to the fields empty. On stopping, the machine is set to actuate the collecting apparatus, to which one end of a piece of cloth is brought. The pieces are previously connected end to end, so that the work goes on continuously. The cloth passes into the locomotive truck, and thence, over rollers, to a truck attached, in which a man sits to guide it. Thus one man will collect 5000 meters of cloth in half an hour, an operation formerly taking eleven hours. The train, when loaded, carries 10,000 meters (over 33,000 feet) of cloth. The machinery is very easily worked. Moving a lever one way or the other varies the speed of travelling; a second lever serves for reversal, and a third to connect the dynamo either with the locomotive or the collecting apparatus. The Faure accumulators in the tender are sixty in number, and the weight is 500 kilograms (1250 pounds). They are charged with the current of the Gramme machine, which has been used since 1879 in lighting the works. With a commutator on the tender, the number of accumulators employed may be increased by successive additions of six up to sixty. The time of action is about three hours. The system, which has been in operation about two months, has given entire satisfaction.

The passage through the St. Gothard tunnel, nine and a half miles long, is also likely to be accomplished by electricity, on account of the difficulty of ventilating the long "bore." Four trains now pass through the tunnel daily each way, and the difficulty of obtaining air, even with this small amount of travel, demands an immediate remedy, in view of the increased tunnel traffic when connecting lines shall be finished. Advice and services have been sought by the chief engineer, M. Bridel, from the Messrs. Siemens, who have prescribed an electric railway similar to one they have constructed in Paris. The expense of the experiment — for such it will be at first — will be about 180,000 francs, or $36,000.

PAPIER-MACHÉ.

Papier-maché, as every one who has a smattering of French is aware, means simply *chewed paper*, which at first thought would seem to be of little practical value, except in the fabrication of the missiles known to mischievous school-boys as "spit-balls." But we have repeatedly had to chronicle the increasing use of paper in the arts. It may almost claim to rival iron in the multiplicity of its industrial applications. In Europe it is employed to a considerable extent in architecture, from a complete church building in Bavaria (capable of seating a thousand persons), having columns, walls, altars, roof, and spire of papier-maché, to the finest traceries of a Gothic screen. Some of the most tasteful halls in Britain and on the Continent are finished in it, in preference to wood. The mantels, and the mirror frames they support, are of its composition; and, strange as it may seem, the very chandeliers, in their gilded elegance, are of this humble material. Its use in architecture can literally have no limit; for no one to-day can say what may not be made of it. In toys, tables, and *bijouterie* of all kinds, we have examples of its extensive uses, and suggestions of future applications. Papier-maché never cracks, as wood, plaster, terra-cotta, etc., will do. In the same articles it can be made, if required, far lighter than plaster, terra-cotta, metal, or even wood. Neither heat nor cold affects it; it can be sawed, fitted, nailed, or screwed, quickly adjusted or removed, gilded, painted, marbleized, or bronzed. It can be made light as cork, or heavy as stone; never discolors by rust, as will iron; is not affected by temperature or oxygen, as is even zinc. It can be made for a given thickness stronger than any white or rare marbles, and is even tougher than slate, quite as hard, and will not chip corners nor crack off in strata.

One of the great advantages of papier-maché is that it can be produced very cheaply. In architecture it can be supplied nearly at plaster prices, and, taking into consideration the price of putting up, costs no more, and sometimes even less. This depends on the size of the ornament, the larger being cheaper in proportion. It can be made to imitate the rarest marbles, as it takes a polish superior even to slate, and costs not half as much as the preparation of plaster of Paris, known as scagliola, while it is infinitely stronger. Pedestals, columns, newel-posts, vases, clocks, and multifarious other articles are made of it in elegant and durable forms. Possibly, as a recent writer remarks, "when the forests of the globe are regarded as curiosities, and the remaining groves are preserved with the same care that has guarded historic trees, the cast-off rags of mankind, and the otherwise useless weeds, reeds, and grasses of the marsh and swamp, will take the place of timber in construction, and many will welcome the change, if for nothing else than that it will obviate much of the nuisance of frequent repaintings."

CHINESE LEAD WORKERS.

The following interesting account of lead working in China is from an article in a recent number of *All the Year Round:* —

Here is a shop — all the houses in a Chinese street are shops of one kind or other — where lead working is carried on; where canisters for holding tea are produced; where lamps for burning oil lights are turned out in highly ornamental and embellished style. Naked, save with a girth around the loins, are the workmen here. One sits over a fire made of charcoal, on which is a caldron of molten lead. Some thin sheets of lead are wanted, so upon a square block of thick pressed paper a spoonful of the white metal is run. Upon this another block of paper is placed, and on this the workman, constituting himself a weight, stands. This seems a poor, primitive, and rude style of doing such business, but mark the result: the top pad is taken off, and a thin sheet of lead lies before you, perfect, save for being uneven at the edges, and the paper pad seems to be barely scorched! Workman number two, with gigantic scissors, cuts this sheet into the desired patterns, fits and refits the pieces, a file bringing them down to the exact dimensions required, while, in a big box, with a wheel before him, like an English street knife-grinder, sits number three, with his lathe, turning corners and emblazoning devices. The work when thus completed is washed with water and scrubbed with sand, and soon shines with the brightness of freshness and novelty. The most remarkable feature about this shop is the fact that while from sunrise to sunset these metallic operations are conceived, prosecuted, and accomplished, and the stock thus increasing, nobody is ever seen to enter the premises and buy the wares, nor even to go the length of stopping to inquire their cost.

INDUSTRIAL MEMORANDA.

Tunnel Ventilation. — A "chemical lung" is the latest thing proposed for the ventilation of tunnels. It was lately tested in London by fourteen scientists. A room 15 feet by 18 was kept for an hour at a temperature of 82°, and the air was loaded with impurities. The men of science were now called upon to enter, and the air was made still more impure by burning sulphur and carbonic-acid gas. Then the "chemical lung," or punkah, so-called, measuring 4 feet by 2½, was set in motion. The temperature was soon reduced to 65°, and the air freed from all impurities. Then fat was burned to test the machine for organic substances, and the "lung" was started up just in time to prevent the examining gentlemen from running out for fresh air. It is proposed to use the invention during the construction of the Channel tunnel.

Italian Mortar. — The London *Builder* attributes the marvellous durability of mortar in Italy to the fact that the lime remains in a pit covered with water for two years before it is used, whereas in England lime is slaked and used the same day. Most building specifications even require new-slaked lime.

Protection against Lead Corrosion. — Professor Emerson Reynolds gives the following as the best means he is acquainted with to protect lead from corrosion: Take 16 grams of solid caustic soda, dissolve it in 1.75 liters of water, and add to the liquid 17 grams of nitrate of lead, or an equivalent of other lead salt, with 250 cubic centimeters of water; raise the temperature of mixture to 90° C. If sufficient lead salt has been added the liquid will remain somewhat turbid after heating, and must then be rapidly strained or filtered through asbestos, glass wool, or other suitable material, into a convenient vessel. The filtered liquid is then well mixed with 100 cubic centimeters of hot water, containing in solution 4 grams of sulpho-urea thiocarb-

mide. If the temperature of the mixture be maintained at about 70° C., deposition of sulphide of lead or galena, in the form of a fine adherent film or layer, quickly takes place on any object immersed in or covered with the liquid, provided the object be in a perfectly clean condition and suitable for the purpose. When the operation is properly conducted, a layer of galena is obtained which is so strongly adherent that it can be easily polished by means of the usual leather polisher. It is not necessary to deposit the galena from hot liquids, but the deposition is more rapid than from cold solutions.

New Fire-Alarm Boxes. — In some districts of London, in place of the locked signal-box, the key of which must be sought for, often at serious loss of time, each station is furnished with a small cast-iron column or post, having a glass pane set in the head, under which is seen an ordinary push-button. In case of the breaking out of a fire, the person who first observes it has only to run to the signal-post, break the glass, and press the button with his finger, until an answering ring from the central office tells him that his call has been received and understood. At the same moment the police are notified, and the extinguishing apparatus of the district is called out. It is said that in the limited territory where the experiment has been tried it has proved very successful, the saving of time in giving notice of fires being of great service in any effort to extinguish them. Some of the American cities, with the same object in view, have provided unlocked signal-boxes in the more important districts, which open by the simple turning of a handle; and it does not appear that false alarms are made any more frequent by the unrestricted access to the boxes which is thus offered to malicious persons.

The "Jumbo" of Machines. — A Newark firm have just completed for a Pittsburgh (Pa.) foundry the largest machine ever made in the United States, and probably the largest in the world. It is a boring and turning machine, which is so large that a special building had to be erected to put it up in. It weighs 110 tons, is 25 feet high, and occupies a space 30 feet square. It will turn, bore, and cut a keyway in wheels of any size up to 16 feet in diameter by 11 feet wide on the face. This ponderous machine is most delicately and accurately adjusted in all its parts, and can be regulated to any desired speed. A belting from the engine runs around a cone pulley connecting with a gearing under a revolving face-plate, the gearing being adapted to various rates of speed, so that it can be made to go fast enough to bore a six-inch hole, or slowly enough to turn a wheel 30 feet in diameter.

Paper Floors. — A new and apparently good process for covering floors is described as follows: The floor is thoroughly cleaned. The holes and cracks are then filled with paper putty, made by baking newspaper in a paste made of wheat flour, water, and ground alum, as follows: To one pound of flour add three quarts of water and a tablespoonful of ground alum, and mix thoroughly. The floor is then coated with this paste, and then a thickness of manila or hardware paper is put on. If two layers are desired, a second covering of paste is put on the first layer of manila paper, and then the second thickness of manila paper is put on. This is allowed to dry thoroughly. The manila paper is then covered with paste, and a layer of wall paper, of any style or design desired, is put on. After allowing this to thoroughly dry, it is covered with two or more coats of sizing, made by dissolving one half pound of white glue in two quarts of hot water. After allowing this to dry, the surface is given one coat of 'hard oil-finish varnish,' which comes all ready bought already prepared. This is allowed to dry thoroughly, when the floor is ready for use." The process is represented to be durable and cheap, and besides taking the place of matting, carpet, oil-cloths, or other like coverings, makes the floor air-tight, and capable of being washed or scrubbed.

A Strong Gum. — Arabine, which forms the chief bulk of commercial gum arabic, is in reality, as many of our readers are doubtless aware, not a neutral organic principle, but the calcium salt of a peculiar acid, for which the somewhat harsh name of "gummic" has been proposed. It has been found that by replacing a portion of the calcium base by some other metal it not unfrequently results in improving the quality of the "gum" from an "adhesive" point of view. Thus, if to each ten ounces of mucilage of the ordinary consistence be added forty-two grains of neutral sulphate of aluminium, previously dissolved in the smallest possible quantity of distilled water, the "gum" so made becomes much more strongly adherent, and may be used for many purposes for which ordinary gum is, by reason of want of tenacity, unsuited. In the course of a few hours a "double decomposition" occurs in the above mixture, gummate of aluminium and sulphate of calcium being formed therein. Chloride of aluminium will not answer this purpose, owing to the deliquescent calcium salt therein produced.

Dynamite. — It is said that the 15 dynamite manufactories now under the control of M. Nobel (the man who introduced nitro-glycerine in its varied forms into public use) turn out about 5000 tons a year. In this country and in Europe it is estimated that the production of explosives containing nitroglycerine is between 7000 and 8000 tons a year, and this quantity has the energy of at least 45,000 tons of ordinary gunpowder.

The Use of Silver in Electroplating. — At the silver-plating works of Christofle, in Paris, there is annually deposited more than 6000 kilograms (of 2½ pounds each) of silver; and since 1842, when the works were started, no less than 169,000 kilograms of silver have been used, being deposited on an enormous variety of objects, in thicknesses suitable to their nature. The mean thickness adopted is that which corresponds to 3 grams per square decimeter, or 300 grams per square meter, of surface. The surface covered with silver at these works alone is equal to more than 56 hectares, — about 138 acres. The total quantity of silver used in Paris for electroplating is estimated at about 25,000 kilograms a year; and in Europe and America together, nearly 125,000 kilograms, worth 25 million francs, or 5 million dollars.

PRACTICAL RECIPES.

Label Varnish. — An excellent varnish, which dries in a few seconds, and produces a colorless, smooth, and shining coat, is prepared, according to R. Kirsten, from the following: —

Sandarac	53 parts.
Mastic	20 "
Camphor	1 part.
Oil of lavender	8 parts.
Venice turpentine	4 "
Ether	6 "
Alcohol	40 "

The ingredients must be macerated for weeks, until everything is dissolved. It is therefore advisable to prepare a sufficient quantity, to last for some time, at once.

Clarifying Shellac Solutions. — Much trouble is generally experienced in obtaining clear solutions of shellac. If a mixture of 1 part shellac with 7 parts of alcohol of 90 per cent. is heated to a suitable temperature it quickly clears, but as quickly becomes turbid again on cooling. The only practical method of freeing the solution from what some writers call "wax," and others "fatty acid," which is present in shellac in the proportion of 1 to 5 per cent., and is the cause of the turbidity, has hitherto been the tedious process of repeated filtration. M. Peltz recommends the following method: Shellac, 1 part, is dissolved in alcohol, 8 parts, and allowed to stand for a few hours. Powdered chalk is then added in quantity equal to half the weight of shellac in the solution, and the latter is heated to 60° R. The greater portion of the solution clears rapidly, and the remainder may be clarified by once filtering. Carbonate of magnesia and sulphate of baryta were tried in the same way, but were not found equally efficacious.

Fireproofing for Wood. — With three parts of alum and one part of green vitriol, make a strong, hot solution with water; make another weak solution with green vitriol in which pipe-clay has been mixed to the consistence of a paint. Apply two coats of the first, dry, and then finish with one coat of the last.

To Make Labels Adhere to Tin. — To the various methods heretofore mentioned, the following may be added: —

(1.) Soften good glue in water; then boil it with strong vinegar, and thicken the liquid, during boiling, with fine wheat-flour, so that a paste results.

(2.) Starch-paste, with which a little Venice turpentine has been incorporated while it was warm.

(3.) Paint solution of tannin over the spot, let dry, and then affix the label previously gummed and moistened.

To Tin Woven Fabrics and Paper. — M. Widemann plates fabrics of linen, cotton, and paper with tin by the following process: Grind powder of zinc with a solution of albumen, and spread the thick liquid with a pencil over the stuffs. After desiccation the layer is made permanent by coagulating the albumen with steam, and afterwards passing the stuffs or the paper through a solution of chloride of tin. The metallic tin is reduced by the zinc in an extreme state of division. Wash the stuffs or the paper, and after desiccation press them.

Safe Colored Fires. — At this fire-work season of the year, it may be well to note that a Swiss chemist advises us to dispense with mixtures containing chlorate of potassium and sulphur altogether, or at least to use them only with the greatest care, and only when needed. Traces of sulphuric acid adhering to the sulphur may start an explosion; mixtures containing nitrate of strontium alongside of sulphur and chlorate of potassium are also very risky, and should not be kept in stock. The following mixtures do not produce quite as handsome a light as those which contain sulphur, but are still quite satisfactory, besides having the advantage of burning without much smoke and poisonous vapors and being absolutely safe: —

Red.

Shellac	1 part.
Nitrate of strontium	5 parts.

Yellow.

Nitrate of sodium, pure and dry	1 part.
Shellac	4 parts.

Green.

Shellac	1 part.
Nitrate of barium	5 parts.

The shellac is fused with the color-producing salt, which must be *chemically pure*, and the resulting mass preserved in tight tin boxes.

To Remove Rusted Bolts. — To remove bolts that have rusted in without breaking them, the most effectual remedy known is the liberal application of petroleum. Care must be taken that the rusted parts are reached by it, and some time must be allowed to give it a chance to soften the layer of rust before any attempts are made to remove the bolt.

To Bend a Wrought Iron Pipe. — Fill it with melted resin. When the resin hardens bend the pipe, and it will retain its round form. Remove the resin by heating.

Agriculture.

ANTS AS INSECTICIDES.

It is new to us that ants are great destroyers of canker worms, and probably other worms or insects of the smaller varieties. We watched with great interest the work of a large colony of black ants, which attacked the canker worms on an elm-tree in our grounds, a few weeks ago, and were delighted with the nature and results of their labors. Two processions of the ants were moving on the trunk of the tree, one going up empty, the other coming down; each ant bringing with him a canker worm, which he held fast in his mandibles, grasping the worm firmly in the centre of the body. Although the prey was of nearly the size of the destroyer, the plucky little ant would run down the tree in a lively way, deposit its booty in its nest in the ground, and instantly return for further slaughter. There were at one time as many as forty coming down the tree, each bringing along his victim, and doing the work with apparent ease. Extending our observations, we noticed that the ants ran up the trunk and out on the limbs, and from thence on to the leaves of the tree, where the filthy worm was at work, and seizing him with a strong grip at about the centre of the body, turned about with the squirming worm and retraced his steps. The worm was dead by the time the ant reached the ground.

If this work of the ants is common, they must prove valuable friends to farmers and fruit raisers, and should be protected in every way possible. We do not believe that the birds that prey upon worms would do the work in a week, in our orchards, which these ants were doing in an hour. We should be pleased to know if this work of the ants has been noticed before.

RED CLOVER AND GYPSUM.

The following article, by Dr. J. B. Lawes, which we take from the London *Agricultural Gazette*, brings out certain scientific facts in a manner at once sprightly and clear: —

The *Gazette*, in an article upon the efficacy of gypsum as a manure for red clover, refers to the result of some experiments at Rothamsted, published twenty years ago. Red clover has continued to grow upon the garden soil at Rothamsted up to the present time, both upon that which is wholly unmanured, and also upon that receiving gypsum; there is more produce upon the gypsum plot than on the unmanured, but less than there is upon the plot receiving alkaline salts.

If gypsum acted as a medium for obtaining ammonia from the atmosphere, it ought to be a better manure for the cereal crops than for clover. Such, however, is not the case.

I am disposed to think that the action of gypsum is due to its supplying both sulphur and lime to the crop; and that it may also liberate and make more available some of the organic compounds of the soil. It has been proved that the leaves of clover contain a large amount of sulphur as such, which sulphur is burnt away, and not found in the sulphate of the ash. In a soil rich in decayed vegetable matter, all the important ingredients taken up by clover may be in excess, as compared with sulphur and lime; in such a case the application of gypsum may produce the wonderful results we read of in the United States. A few years ago, when the agriculture of the States was in a distressed condition, I came upon a remark, made by a farmer in one of the journals devoted to agriculture, to the effect that farming was generally prosperous where gypsum produced good crops of clover! The soils upon which the gypsum produced such good results must either have been naturally very fertile, or there must have been large reserves of fertility stored up in them.

The want of special knowledge with regard to the food available for the clover plant in various soils makes the success or non-success of an application of gypsum a mere matter of speculation; and while I fully appreciate the value of red clover as an agricultural crop, I am disposed to think that it has obtained credit for certain qualities to which it can lay no just claim.

If a householder finds the food in his larder, or the beer in his cellar, disappearing in an unaccountable manner, he is apt to think that some one has taken them; and however much those who have access to the larder or cellar may protest, and appeal to their previous good character, he may still have his suspicions. I own to having somewhat of a fellow feeling with the householder as regards my position and that of the red clover in the garden soil. I find that an immense quantity of the nitrogen has been abstracted. I also know that the red clover does consume a large quantity; indeed, the fact is admitted by the plant, but at the same time it protests that not one particle was taken from the soil; asserts that the whole was taken from the atmosphere; offers to call M. Ville from Paris in support of this view of the case; takes its stand upon previous good character, and appeals to all the science and practice of the world for testimony in its favor!

What am I to do? The nitrogen is gone, and no other plant has had access to it but the red clover! Possibly it may have been wrong to expose the plant to temptation in the form of a large store of its favorite food; but I must say in justification that it absolutely declined to live in my service under any other conditions.

SIFTED MOSS IN SEED BEDS.

The following is from a paper by Mr. Peter Henderson: —

When the seed of most plants germinate where they are thickly sown, the stem strikes down into the soil, the roots forming a tap-root with few fibres, unless arrested by something. Here comes the value of our $\frac{1}{4}$ inch of sifted moss, placed $\frac{3}{4}$ inch from the top. As soon as the rootlets touch the moss they ramify in all directions, so that when a bunch of seedlings is lifted up and pulled apart there is a mass of rootlets, to which the moss, less or more, adheres attached to each. To the practical gardener, the advantage of this is obvious: the tiny seedling has a mass of rootlets ready to work, which strike into the soil at once. The advantage of the moss covering of the seed is not so apparent in the matter of a free-germinating seed, such as cabbage, as in many others, but in many families of plants it is of the greatest value. For example, last November I took two lots of 10,000 seeds of *Centaurea candida* (one of the dusty miller plants, so much used for ribbon lines); both were sown on the same day, and exactly in the same manner, in boxes of 2 inches deep of soil; but the one lot was covered with the sifted moss, and the other with fine soil. From the moss-covered lot we got over 9000 fine plants, while from that covered by soil only about 3000. The same results were shown in a large lot of seeds of the now famous climbing plant, *Ampelopsis Veitchi*, and in the finer varieties of clematis. The reason is plain: the thin layer of sifted moss never bakes or hardens, holding just the right degree of moisture, and has less tendency to generate damp or fungus than any substance I know of. In this connection I may state that the use of wintered lettuce plants for forcing in green-houses or hot-houses is here, to a great extent, being abandoned, and that the plants used for that purpose are such as have been sown five or six weeks only previous to planting, in the manner described for cabbage plants; sowings being made for succession as required. These young plants are found to be far less liable than others to the lettuce disease, known as "rust" or "blight," which has created so much havoc in forcing this vegetable in all quarters of the country. I have been written to by hundreds in relation to a remedy for this disease, and know of none, except the use of young plants, raised as above recommended, using, wherever practicable, fresh soil each season. One of my neighbors, who uses nearly 3000 sashes in the forcing of lettuce, has adopted this plan for the past two years, and has had no lettuce disease.

TO RENDER STRAW MATS, STAKES, ETC., MORE DURABLE.

In a communication addressed to the French National Horticultural Society, M. Huet gives the following information on this subject: —

"Weary of having so often to undertake the manufacture of straw mats and flower sticks, I resolved, in 1878, to subject them to a preparation which had already succeeded well eight years previously in the case of ordinary wood, with the result that my straw mats made four years ago, and in constant use from October to May, are scarcely to be distinguished from new. I am convinced that they will never be rendered useless through the material decaying. Peeled nut sticks prepared at the same time, and which have remained in the earth ever since, do not show the slightest signs of decay. I prepare them in the following manner: In a cemented tank containing a solution of sulphate of copper I put the mats, preventing them from floating by means of a lever fixed on the edge of the tank provided with a weight at the other end, and which bears on two pieces of wood placed crosswise on the mats. They are left for about twenty-four hours in the solution, when they are withdrawn, and when half dry they are steeped in lime-water. I prepare in the same manner stakes, flower sticks, trellis-work, wood-work for frames, etc., but with this difference, that these remain in the solution from eight to fifteen days, according to the dryness and thickness of the wood. For the straw mats, fifty grams of sulphate to a liter of water will be necessary, doubling the strength for the other materials mentioned. In order to quickly dissolve the sulphate of copper, it should be put into a closed wicker basket, keeping it near the surface of the water. As an instance of the duration of wood thus prepared, some stakes fixed in the ground in 1870 are still in a good state of preservation. Similar stakes, but unprepared, last only two years." M. Huet adds that string, straw for thatching, certain kinds of wood for building, and many other things may be similarly prepared, but care must be taken that no nails are in the wood, or they will be promptly dissolved. Wood having received the double preparation of sulphate and lime takes paint very well.

THE SUNFLOWER.

This showy plant is to be commended on other than "æsthetic" grounds, and the *Springfield Republican* thus sets forth some of its claims to the attention of the "practical" man:

The sunflower, so common in country gardens, possesses many more desirable qualities than have been supposed. Its cultivation is worthy the attention of all farmers, hen raisers, and bee fanciers, as the blossoms will feed the bees, and its seeds are the most excellent food for poultry in winter on account of the oil they contain, while the leaves are said to

make good fodder, if dried in the sun, cut up fine, and mixed with bran, for milch cows. In England large quantities of sunflowers are raised solely for the purpose of feeding stock and hens.

In Russia the sunflower is extensively cultivated for the oil the seeds contain. The oil is palatable, clear, and flavorless, and it is used for adulterating olive oil, being exported from St. Petersburg to the shores of the Mediterranean Sea. Next to poppy-seed oil, sunflower oil burns the clearest and longest, so that the peasants apply it to household purposes. From the stalks of the plants they also make a good quality of potash, and the residue of the seeds, after the oil is extracted, is made into oil cake for feeding to stock. Sheep, pigs, rabbits, and all sorts of poultry will also fatten rapidly upon the oil cake, and will eat the seeds with as good a relish as they eat corn.

The sunflower will grow anywhere, and it is an excellent plant to absorb bad air and prevent malarial diseases. It should therefore be planted about pig-pens, barn-yards, and hen-roosts, and serve a double purpose. The seeds should be planted twelve inches apart, and when ten or twelve inches high earth them up like corn hills, and they will ask no further attention at your hands. Each plant will produce at the lowest estimate 1000 seeds. The centre flower often produces that amount, and the lateral flowers several hundreds. Six pounds of seeds will plant an acre, and it can be planted after the crop of early potatoes has been harvested.

The oil extracted from the seeds is most excellent for making the nicest kinds of toilet soap; and if the stalks are treated like flax they will produce a silky, fine fibre, which, it is said, the Chinese use to adulterate their silk manufactures. They raise large quantities of sunflowers, and with them originated the double varieties. The stalks can also be used in manufacturing paper. Surely all these facts prove that "there 's millions" in the culture of the sunflower.

GLEANINGS.

A Fertilizing Problem Solved. — An interesting case in agricultural chemistry has been lately described by M. Ladureau. In the North of France there are a number of farmers who are also distillers of beet, etc., and the liquid residue of the distillation, known as *vinasses*, they distribute over their fields. It contains all the nitrogen, salts of potash, and phosphates which the beet has removed, and by large application of it a good crop of beet can be had every two or three years. But for the crops grown between there is no special provision of manure; they have to subsist on the fertilizing matters left in the ground. One of these farmers came to M. Ladureau and stated that he had thus grown beet and wheat alternately on the same ground for twenty years, and, while the beet crop was always satisfactory, the wheat had gradually deteriorated. On analyzing the soil, M. Ladureau found that it contained all the elements of fertility except phosphoric acid; this had completely disappeared in an upper layer about a foot in depth. He advised the farmer to apply immediately large quantities of soluble and insoluble phosphates of lime, and, on this being done, the wheat rapidly improved.

Fertility from Whey. — Mr. H. I. Losee, a Canadian, who has for two seasons been using whey as a fertilizer, reported favorably upon the experiment at one of the recent dairy meetings in Ontario. The whey from 1,500,000 lbs. of milk worked up at the factory is spouted at a safe distance to avoid the smell, and deposited in a large vat. From this it is run into a tank on wheels prepared with suitable hose, and taken to a piece of fallow ground, upon which hogs for consuming the whey are kept, and is there run into troughs and fed. The troughs are moved from place to place occasionally to distribute the refuse equally over the surface. Feeding on the fallow continues till time to put in wheat in the fall, when the troughs are moved to a lot which is to be fallow the next year, where they are used for the remainder of the season. In this way 150 pigs, fed during the cheese-making months on a ten-acre lot, enriched it to a very high degree of fertility.

Petroleum for Ants. — A correspondent of the London *Garden* writes: For several years one of our garden beds was rendered almost useless by the tunnellings of ants; many remedies were tried, and at last pure petroleum was poured over the ground. After a fortnight young plants were bedded in it, and suffered no ill effects, though the soil smelt strongly of petroleum. This happened two years ago, and the ants have never since returned.

To Destroy Night-Flying Insects. — A simple apparatus for getting rid of cock-chafers and other nocturnal insects, has been devised by M. Vittellier, of Nantes, and is figured in *La Nature*. It depends on the attraction of light for these insects, and consists of a lamp placed at the top of a movable frame, and having four square-shaped narrowing cases, with metallic reflecting surfaces in the interior, placed round it. The insects fly into these, and strike against a pane of glass, at the bottom of which is a funnel-shaped aperture leading to a bag hung below; and into this they fall in great numbers.

A New Insecticide. — Professor Taylor, of the Agricultural Department, announces the important discovery that naphthaline is a sure insecticide. If, he says, seeds, grain, dormant plants, vines, etc., be placed in a tall vessel with a small quantity of the naphthaline, and the vessel be covered, in a few hours any insect which may infest will be as hyxiated. If the substance be chemically pure it will not affect the vitality of the seeds or plants.

Counting Grass Seed. — The Highland Agricultural Society of Scotland has set some one who had nothing better to do to counting the number of seeds in an ounce of various kinds of grass seed, and has discovered that in an ounce of timothy there are 74,000 grains, and in an ounce of red-top 425,000 grains. It is to be hoped that nobody will dispute the returns and demand a recount.

Small Birds in Michigan. — Michigan has a very stringent law for the protection of small birds, which forbids the killing of a robin, nighthawk, whippoorwill, finch, thrush, lark, sparrow, cherry bird, brown thrasher, wren, martin, oriole, woodpecker, bobolink, or any other song bird, under a penalty of $5 for each bird killed, and for each nest robbed, ten days in the county jail.

A Hint for Sheep Owners. — A quiet Virginia granger who lost 20 sheep by dogs, one night a while ago, went to the owner of a suspected cur and asked that it be killed. The owner of course said that his dog was innocent, and the quiet granger went away. He piled the 20 sheep's carcasses in a heap, built a little rail fence about them, and smiled a quiet smile. The fence was made so as to form a sort of half covering over the mutton, in shape like an Esquimaux hut, with a hole at the top, so that, while any kind of a dog could run up on the outside and jump in, no possible dog could ever jump out. The next morning the granger strolled out to the trap with a shot-gun and killed the suspected cur. But he let the trap remain and repeated his strolls until he had shot 46 dogs, and there is not now a bark to be heard in all the town.

A celebrated entomologist predicts a scarcity of potato-beetles and other injurious insects this summer, on account of the lack of snow during the winter, and the continual thawing and freezing of the surface of the ground, which destroyed millions of the eggs of these pests.

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

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"PROFESSIONAL" FASTING.

Whatever may be said of the therapeutical value of fasting in certain ailments, and of the importance of experiments to guide the physician or the patient in the use of this mode of treatment, we cannot help regarding the "professional" fasters who advertise their feats in this line as among the weakest and most contemptible of the large class of seekers for newspaper notoriety. That they are fools has been pretty clear, and it now appears that in their special "gift" they are outdone by the hog. This gluttonous and stupid creature, according to Dr. Greenley (who recently read a paper on this subject before the Kentucky State Medical Society, which has been printed in the *Louisville Medical News*), is the model "faster;" and the more nearly the human animal resembles his porcine rival, the more likely he is to distinguish himself in prolonged attempts at abstinence. Dr. Greenley closes his article with the following conclusions: —

(1.) That man possesses the capacity of fasting, without suffering any special deleterious effects, a much longer time than was formerly thought possible for him to endure. (2.) That the protracted abstinences of Dr. Tanner and Mr. Griscom have convinced the world that the fasts practised in ancient times, as cited in the Bible, were not necessarily miraculous in their character or sustained by Divine influence. (3.) That those who have been heretofore skeptical as to the truthfulness of said scriptural statements will now perhaps have their incredulity removed. (4.) That the man who possesses the most adipose tissue, other things being equal, is enabled to abstain from food longer than his fellow possessing less of that material. (5.) That quietude both of mind and body adds very materially to the ability to protract the fast. (6.) That the inferior animals, especially the pig, possess greater endurance in this respect than man. (7.) That this power of endurance depends in a great measure on the fact that in the hog there is no mental activity: hence the greater ability possessed by the imbecile to fast than by those whose mental faculties are in a normal condition.

A RELIABLE "BLOOD PURIFIER."

The popular faith in "blood purifiers" is a never-failing source of revenue to the quacks and medicine-makers, who are disinterestedly eager to supply the demand. The advertising columns of the newspapers teem with profound treatises on the importance of keeping the blood pure, all ending, like an old-fashioned sermon, with a "practical application" in the form of admonitions to buy Dr. So-and-So's "bitters," pills, or other medicament. The following, which we find uncredited in an exchange, is so good a prescription in this line that we are glad to advertise it gratuitously: —

The best blood purifier known to the medical profession is the following: First, plenty of cold-water ablutions; that is, every morning of the year take a cold-water sponge-bath over the whole body, followed by vigorous rubbing with a coarse towel, using quick, brisk action, the whole process not taking more than three minutes' time. In dressing, wear

flannel next to the skin throughout the year. Second, eat plenty of plain, nourishing food, plenty of rare beef and mutton, partaking freely of fruits, fresh or stewed, and of vegetables, particularly the summer vegetables, as being more digestible; ignore artificial sweets of all kinds, pies, hot puddings, pastries, heavy preserves, etc. Third, plenty of outdoor exercise every day; take good long walks, not to over-fatigue, however; plenty of fresh air and sunshine; plenty of ventilation to your house and rooms at all times, day and night. Let the fresh air into your sleeping-room at night, in winter as well as summer, and see to it in every way that you breathe pure oxygen every hour out of the twenty-four, instead of carbonic-acid-gas poison. Take plenty of sleep and at regular hours, and strictly avoid alcoholic drinks and tobacco in any form.

These four — daily cold-water bathing, good food, fresh air, and exercise — form together the only specific blood purifier known. Medicine, drugs, and herbs will not alone purify the blood; the most they can do is sometimes to assist nature in making a start on the right road.

ANIMAL CHARCOAL FILTERS.

Animal charcoal has been generally regarded as one of the best materials for packing filters intended for the purification of water for drinking and culinary purposes, but Professor Frankland, in a recent letter to the London *Times*, gives the results of his investigations concerning it as follows: —

My first experiments on the filtration of water through animal charcoal were made on the New River Company's supply in the year 1866, and they showed that a large proportion of the organic matter was removed from the water. These experiments were afterwards repeated, in 1870, with Thames water supplied in London, which contains a much larger proportion of organic matter, and in this case also the animal charcoal removed a large proportion of the impurity. In continuing the use of the filter with Thames water, however, it became evident that the polluting matter removed from the water was only stored up in the pores of the charcoal, for, after the lapse of a few months, it developed vast numbers of animalculæ, which passed out of the filter with the water, rendering the latter more impure than it was before filtration. As a member of the Royal Commission on River Pollution and Domestic Water Supply, I reported in 1874 on these experiments as follows: "Myriads of minute worms were developed in the animal charcoal, and passed out with the water, when these filters were used for Thames water, and when the charcoal was not renewed at sufficiently short intervals. The property which animal charcoal possesses in a high degree, of favoring the growth of the low forms of organic life, is a serious drawback to its use as a filtering medium for potable waters." Animal charcoal can only be used with safety for waters of considerable initial purity; and even when so used, it is essential that it should be renovated at frequent intervals, not by mere washing, but by actual ignition in a close vessel.

WHERE IS A MAN'S STOMACH?

One would suppose that by this time the position of the human stomach should have been definitely settled by physiologists, but according to Dr. Leshaft, Professor of Anatomy at St. Petersburg, the statements on this point in the text-books are erroneous. The London *Lancet* gives the following summary of his conclusions, based on careful observations upon more than a hundred bodies: —

The stomach does not, as is usually asserted, lie horizontally in the abdominal cavity, but vertically, so that the fundus touches the diaphragm; the smaller curvature and pylorus are to the right, and the larger curvature is to the left. Its position is in the left hypochondrium, and the situation of the pylorus is in the vertical line formed by a continuation of the right margin of the sternum. If the stomach is enlarged, no one part can be alone displaced, but all parts are equally moved by the distention. The arrangement of the muscular fibres of the stomach is such that food entering it is moved toward the pylorus, where it can be most thoroughly mixed with the gastric juices, and it then passes back along the centre of the cavity to the fundus, where the resistance is least. This movement of the food along the wall to the pylorus, and back again along the centre, is rendered possible by the form of the organ, and it is probable that it is to this movement that the peculiar shape of the fundus is due. As is well known, the fundus is absent in newly-born children. Thus the shape of the stomach determines the long retention of food in the organ for the purposes of digestion, and its slow passage through the pylorus. If the transverse colon is distended with gas, it may rise to the left of the stomach as high as the fourth intercostal space, and even as high as the fourth rib. If the coils of the small intestine are similarly distended, the lower part of the stomach may be pressed forward, and the stomach may assume a more oblique position. Even a large stomach, accustomed to dietetic repletion, maintains a vertical position, but the pylorus is moved a little upward and to the right.

METEOROLOGY FOR JUNE, 1882.

The sum of my observations on the weather for the past month is as follows: —

Average Thermometer.		Lowest.	Highest.	Range.
At 7 A. M.	62.47°	54°	76°	22°
At 2 P. M.	75.07°	56°	90°	34°
At 9 P. M.	64.13°	53°	80°	27°
Whole month	67.22°	53°	90°	37°
Second average[1]	66.45°			
Last 19 Junes	66.44°	62.54° in 1869	71° in 1865.	7.90°
Second average[1]	65.82°	61.22°	68.48°	7.26°

[1] Found by adding the average evenings *twice*.

The average barometer for the month was 29.845 inches, the lowest, 29.61, on the 1st, and the highest, 30.17, on the 13th and 14th, a range of only .56 of an inch. The average for the last ten Junes has been 29.904, the lowest June being 29.845, in 1882, and the highest, 29.957, in 1875 and 1876 (alike), a range of .112 of an inch. The sum of daily variations was 2.94 inches, an average daily movement of .098 of an inch. The average for the last ten Junes was .138, with extremes of .058 and .323 in 1876 and 1878. The rainfall in June of those years was .85 and 3.14 inches, corresponding in a degree with the greater or less movements of the barometer.

The face of the sky in 90 observations gave 52 fair, 18 cloudy, 16 overcast, and 4 rainy. The amount of rain was 1.53 inches. The average for the past 14 years has been 2.99 inches, the lowest amount, 0, in 1873, the highest, 5.30, in 1875.

The prevailing direction of the wind was west 23.30° south, or nearly W. S. W. The excess of the southerly over the northerly was 23 observations, that of the westerly over the easterly 53. The average direction approximately for the past fourteen Junes has been west 20.5° south, showing the past month to be near the average. The westerly winds of June have prevailed over the easterly every year, varying from 8 to 53 observations, an average of 28.7; while the southerly have prevailed over the northerly every year except three (in 1870, 1872, and 1881), and varying from 18 northerly to 40 southerly, an average of 10.5 southerly.

Although the month has been a trifle above the average temperature, the season has continued to be from two to three weeks later than that of 1880, and probably a week to ten days behind the yearly average. I have not sufficient data to decide this with accuracy. The month, as usual, was pleasant, with some extremes and some very fine days. The 24th and 25th reached an average of 81°, while the 12th was below 57°, and the 1st and 11th nearly the same. The first lightning and thunder of the season occurred on the 4th, in connection with .28 of an inch of rain. The general aspect of the sky was a near average for June for the past eighteen years, which give 52 fair observations, with extremes of 37 and 68, equivalent to 17.3 days, or nearly three fifths of our Junes fair. The hay crop is abundant, and there is a good prospect for a favorable harvest of most fruits and general productions of the soil.

D. W.

Natick, *July* 8, 1882.

A MODERN FABLE.

Some of the eccentricities of modern adulteration are delicately disclosed to the commonwealth of consumers by a contemporary German satirist, in the following neat little fable: —

"There were once four flies, and, as it happened, they were hungry one morning. The first settled upon a sausage of singularly appetizing appearance, and made a hearty meal. But he speedily died of intestinal inflammation, for the sausage was adulterated with aniline. The second fly breakfasted upon flour, and forthwith succumbed to contraction of the stomach, owing to the inordinate quantity of alum with which the flour had been adulterated. The third fly was slaking his thirst with the contents of the milk jug, when violent cramps suddenly convulsed his frame, and he soon gave up the ghost, a victim to chalk adulteration. Seeing this, the fourth fly, muttering to himself, 'The sooner it's over the sooner to sleep,' alighted upon a moistened sheet of paper exhibiting the counterfeit presentment of a death's head, and the inscription, 'Fly Poison.' Applying the tip of his proboscis to this device, the fourth fly drank to his heart's content, growing more vigorous and cheerful at every mouthful, although expectant of his end. But he did not die. On the contrary, he throve and waxed fat. You see, even the fly poison was adulterated!"

EDITORIAL NOTES.

A Practical Reformer. — A London medical exchange says: An old acquaintance of ours, — a cockney born and bred, who, as all true cockneys should, regards the city as the grandest place in the world in every respect, — has lately set himself the task of removing daily from the footpaths of the city six pieces of orange-peel. If by any chance he fails to fulfil his daily task, he adds the default to the following day, and makes his weekly task complete. He commenced his task some four months ago, and he says that in all that time he has never seen one policeman condescend to so humble an office. He calculates that if every piece of peel he removes averts only one accident, he prevents about 1000 accidents yearly, the orange-peel danger lasting but six months. He observed, with the greatest possible seriousness, "What a pity I was not at Mentone the other day! for if I had been, I should in all probability have saved poor Prince Leopold from his sad accident."

Military Pocket Handkerchiefs. — Last year a Swiss manufacturer, Herr Wettstein, of Töss, in the Canton of Zürich, "published" a military

pocket-handkerchief, illustrated with diagrams of all the portions of the new Wetterli rifle, with explanatory notes in German and French. It appears that a specimen found its way to the French War Office, and it was so highly approved of that a pocket-handkerchief of a similar character, but with a number of improvements, has now been introduced into the French army. The material is cheap cotton, and the article is so handled as to serve as a vehicle of military instruction as well as cleanliness. The centre is occupied with the Cross of the Legion of Honor upon a red background, and the inscription underneath it, *Honneur et Patrie.* Around this central point are grouped a circle of medallions, containing representations of officers of all grades, from the modest sub-lieutenant to the proud commandant of a *corps d'armée.* The different uniforms are pictured so distinctly that the French private can tell, at a glance, to what grade any officer whom he may see has attained. The special pocket-handkerchief prepared for the infantry soldier has exact drawings of the arms used by him, with explanations of their mechanism. The borders of the handkerchief are hemmed in with a framework of the national colors, and within this framework are printed a number of sanitary precepts to be observed on a march and during a campaign.

Man and the Bacillus. — Dr. J. Milner Fothergill, in a letter to the *Philadelphia Medical Times*, referring to Koch's theory of the origin of tuberculosis, remarks, half jocosely: "Talk of the bitterness of death! It is nothing to the shadowy danger which overhangs us of a tubercle-bacillus getting into one's pulmonary alveoli in an unguarded moment, and when one's 'resistive power' happens to be impaired. Shadowy in the sense of invisible, not unreal! Is this what is meant by 'the doom of a great city'? Is the bacillus a relative of the poison-germ which slew Sennacherib's host in a night? We do not yet know the little creature intimately enough to say. But, really, the horrors which the mind conjures up of the dangers of the bacillus in the future are demoralizing. Suppose, now, that some change of the human constitution should favor the bacillus, just as the potato-field did the Colorado beetle, who had been happily quiet in his dietary of the leaves of the deadly nightshade, but who went on the war-path when the leaves of the other members of the Solanaceæ came within his reach. The imagination fails to conceive what may be the fate of man, — to be slain by a foe more remorseless than any of the plagues of Egypt. Suppose, now, that the bacillus took such a new departure, and got ahead of our 'resistive power.' Why, man would be swept off the face of the earth! What an ignominious end, too! Man, in the plenitude of his power over the forces of nature, slain by an insignificant little bacillus!"

False Eyelashes. — Labouchère says in *Truth:* "The Parisians have found out how to make false eyelashes. I do not speak of the vulgar and well-known trick of darkening the rim round the eye with all kinds of dirty compositions, or the more artistic plan of doing so to the inside of the lid. No, they actually draw a fine needle, threaded with dark hair, through the skin of the eyelid, forming long loops, and after the process is over — I am told it is a painless one — a splendid dark fringe veils the coquette's eyes."

A Military Eclipse. — A German paper says that on the morning of the recent solar eclipse Captain Von S—— issued the following verbal order to his company, through his sergeant-major, to be communicated to the men after forenoon parade: "This afternoon a solar eclipse will take place. At three o'clock the whole company will parade in the barrack-yard. Fatigue jackets and caps. I shall explain the eclipse to the men. Should it rain, they will assemble in the drill-shed." The sergeant-major, having set down his commanding officer's instructions in writing, as he had understood them, formed the company into hollow square at the conclusion of the morning drill, and read the order to them, thus: "This afternoon a solar eclipse will take place in the barrack-yard, by order of the captain, and will be attended by the whole company, in fatigue jackets and caps. The captain will conduct the solar eclipse in person. Should it rain, the eclipse will take place in the drill-shed."

A New Asylum for the Aged at Paris. — The Paris Assistance Publique has just completed the purchase of a large quantity of land at Villejuif, one of the most healthy environs of the capital. On this it is about to build an immense *asile-hospice*, into which will be received aged persons of both sexes, who must be not less than sixty years of age, and must have inhabited the Department of the Seine for at least five years. The hospital will accommodate 3000 inmates, lodged in separate chambers. A special cemetery will be attached to the establishment. The cost is calculated at nearly three million francs.

The King and his Census Paper. — The taking of the census in Italy has just been effected. The King, as an example, filled up a census paper in due form as to the names and ages of the members of his family, together with other particulars. He described himself as "Humbert of Savoy," and under the head of what "profession" wrote "King of Italy." The document is to be preserved in the public archives.

A Novelty in Sanitary Lectures. — The Manchester and Salford Sanitary Association are about to give a series of lectures on Health during the dinner-hour of the operatives in large works. These are not to be after-dinner lectures or speeches, but the auditors are expected to listen while they eat.

To Make Tents and Awnings Waterproof. — Tents made of very light canvas will become perfectly waterproof, as well as proof against mildew, if first soaked in a strong solution of soap, and afterwards passed through a liquid made by dissolving equal parts of alum and sulphate of copper in five times their united weight of water.

Vivisection Laws in England. — The absurdity of the English law against vivisection is well illustrated by a remark of Sir James Paget. He says: "I may pay a rat-catcher to destroy all the rats in my house with any poison he pleases, but I may not myself, unless with a license from the Home Secretary, poison them with snake poison."

ATOMS.

The Italian Government are organizing for the navvies who are employed in the Tunnel, and still suffering from anæmia and other ailments arising from the bad air and high temperature in which they are compelled to work, a sanatorium for their reception high up on the St. Gothard, — pure mountain air being the most efficient remedy for diseases of this class.

Rowland Hill rode a great deal, and by exercise preserved vigorous health. On one occasion, when asked by a medical friend what physician and apothecary he employed, to be always so well, he replied, "My physician has been a horse, and my apothecary an ass."

One of the hardest woods in existence is that of the desert ironwood-tree, which grows in the dry wastes along the line of the Southern Pacific Railroad. Its specific gravity is nearly the same as that of lignum-vitæ, and it has a black heart so hard, when well seasoned, that it will turn the edge of an axe, and can scarcely be cut by a well-tempered saw. In burning it gives out an intense heat.

Telephonic communications have recently been interchanged between Brussels and Paris, the problem of executing these having been solved by M. Van Ryselberghe's new invention. The French Government, it is said, has just purchased this new system for a million francs, the Belgian Government, to whom the inventor had offered it, having refused to buy it.

Professor Hoefer, of the Académie Impériale des Mines, says the deepest mine in the world is the Przibram silver mine in Bohemia. The lowest depth is nearly 3300 feet below the surface, at which point the temperature of the rocks is only 75.9° F., and the temperature of the air 76.3° F.

A Chicago funeral notice says, "The burial casket was made to conform as far as possible with the comforts the occupant was wont to surround himself with when in the home he left!"

A very simple dropper may be made by bending a piece of glass tube at a right angle, and drawing one end out to a point. On inserting the other end into the bottle, and gently inclining the latter, some of the liquid will ascend along the tube, even before the liquid in the bottle has reached the mouth, and may be dropped at will.

The physician, says Schopenhauer, sees man in all his weakness; the lawyer sees him in all his wickedness; the theologian, in all his littleness.

The St. Gothard Line not only has the longest tunnel in the world, but twenty-four miles, or more than one-fifth of the whole line, consists of tunnels. Many of these have had to be constructed in spiral or corkscrew fashion, whereby, while making the necessary rapid ascent from the valleys to a higher elevation, the line is perfectly protected against the avalanches, which are frequent at those spots.

Harvest prospects in France are so good that, the *Débats* says, for the first time for four years France will have no occasion to import food from abroad.

Paper labels, attached in the usual manner, and, when dry, varnished over with two or three coats of good copal varnish, will be found to resist almost all chemicals except liquor potassæ and liquor sodæ.

Platinum crucibles, on being ignited, suffer a greater or less decrease in weight when they are new, but after repeated ignition such changes no longer occur.

A competitor in the Spence's metal field is made by M. Potel, and consists of gelatine, glycerine, and tannin, for sealing bottles, etc.; and for making ornamental articles, sulphate of baryta or zinc white is added with any ordinary coloring matter.

LITERARY NOTES.

Messrs. H. C. Baird & Co., of Philadelphia, have just published *A Practical Treatise on the Fabrication of Volatile and Fat Varnishes, Lacquers, Siccatives, and Sealing Waxes*, from the German of Edwin Anders, manufacturer of varnishes and lacquers; with additions on the same subject, and on stains for wood, horn, ivory, bone, and leather, from the German of Dr. Emil Winckler and Louis E. Andés; the whole translated and edited by W. T. Brannt. The book, which seems to be very full and complete, — like all the technical manuals that bear the imprint of Baird & Co, — is a neat octavo of 346 pages, and retails at $2.50. It may be found at Williams & Co.'s.

In reply to sundry correspondents we would state that Gillet and Rolfe's new series of text-books in physical science is really new in all respects, and in no sense a revision of the old "Cambridge Physics," by the same authors. When complete, it will include three books on natural philosophy, two on astronomy, and two on chemistry. The first three are already out: *Natural Philosophy*, 509 pages, 510 illustrations; *Elements of Natural Philosophy*, 313 pages, 345 illustrations; and *First Book in Natural Philosophy*, 191 pages, 191 illustrations. The *Astronomy*, 403 pages, 466 illustrations (including six colored plates), is also ready; and the *First Book in Astronomy*, 212 pages, 222 illustrations (six colored plates), is in the hands of the binder. The two books on chemistry will probably be issued early in 1883. The publishers are Potter, Ainsworth & Co, of New York. The old series will be kept in the market for the present, and the *Natural Philosophy* is still the *required* book (Arnott's being the only one named as an equivalent) for admission to Harvard College.

Medicine and Pharmacy.

THE ASSIMILATION OF FAT.

Most physiological text-books teach that the fat of the body is not derived directly from the fat of the food. But from statistical analysis Hoffmann, according to the *Lancet*, has arrived at the conclusion that the formed fat of the animal body arises not only from heterologous elements of the food, but also in part, at least, from ingested fat. Radzcejewsky concludes that the special destination of this fat is the intramuscular adipose tissue. A series of investigations, undertaken by Lebedeff in the clinical department of the Pathological Laboratory at Berlin, leads him also to the conclusion that the ingested fat is deposited unchanged in the fatty tissue of the body. Two dogs were kept fasting for a month, losing in the time about 40 per cent. of their weight. Previous experiments have shown that under these circumstances all the fat of the body disappears. The dogs were then fed on a diet which consisted of large quantities of fat foreign to their own nature, and a small quantity of flesh. Both dogs regained their normal weight in three weeks, and were then killed. One had been fed on linseed oil, and from its tissue was obtained more than a kilogram of fatty oil, which did not become solid at the freezing-point of water, and which corresponded closely in chemical characters to linseed oil. The second dog was fed on mutton suet, which had a boiling-point about 50° C., and in its body, in the muscles, about the internal organs, and beneath the skin, a form of fat was found which was almost identical with suet. The organs of each dog were free from disease. Thus it would appear that ingested fat, even such as is foreign to the individual constitution, may yet become transformed directly into the fatty tissue of the animal. Other experiments of the same investigator seem to show that this is true also of milk fat.

SMALL-POX IN BIRDS.

Dr. Hewson, of Philadelphia, asserts that he has traced small-pox to the nests of the English sparrows, which had already mischief enough to answer for; and the editor of the *Pittsburgh Medical Journal* says that he saw the eruption of small-pox among the poultry of a family he was attending for that disease, in 1849. The disease was manifested principally on the head and comb of the fowl, and the parts beneath the bill not covered with feathers. These parts were covered with pustules resembling those met with in the human subject, closing the eyes and swelling the head to double its former size. The disease appeared to be contagious, and was quite fatal.

A recent bulletin of the Washington Board of Health calls attention to the same subject. It states that in Europe and Hindostan variola is so common in pigeons and poultry as to constitute a veritable plague. Thus, Guersant records that out of a dovecote of one thousand, scarce one hundred could be found that did not bear marks of the disease; while Tytler says the poultry-yards in India were habitually depopulated by the plague. Bechstein and others claim that it is the true small-pox derived from the human being, and conveyable back to man; while others, like Foggia and Gilbert, assert that it is communicable to the sheep. That this affection has not been recognized may be due to a difference in the environment which modifies the infection, or perhaps to the fact that men and pigeons do not live so much in common here as in Italy and India.

The *St. Louis Clinical Record*, referring to the matter, remarks that such an occurrence, even as far away as Italy, "should demand a careful investigation into the reality of such affection in the United States (and especially in the Southern ones) during the prevalence of an epidemic of small-pox, so that whatever danger arises from this source may be detected and guarded against."

FEEDING THE BABY.

The following is from Dr. C. E. Page's "How We Fed the Baby," which, though first published a little more than a year ago, has already reached a third edition, owing its success largely to its having been approved by many of our best physicians, though the system it advocates is in direct opposition to all the established customs and traditions of nurses: —

"The mother who essays even so mild a reform as the restriction of her new-born babe to a 'square meal' every three hours is likely to change nurses several times before finding one who will permit such 'cruel nonsense.'

"Those who advocate non-restriction in the nursing or bottling of infants are fond of asserting that colts, kittens, puppies, etc., under natural conditions, 'nurse all the time,' and they ask, Why should n't babies have the same liberty?

"People who argue thus do not consider the fact that babies are not often as 'naturally' supplied as young animals of the lower order. In some respects our civilization works adversely to the interests of the 'race of infants:' few of our modern women are, strictly speaking, 'natural mothers;' too often the aliment supplied by them is affected injuriously by the unnatural conditions incident to their mode of life. The milk may be excessive in amount and deficient in quality, — an evil which frequent nursing tends to increase. Often it is deficient both in quantity and quality and is thought to be in some instances, when, in fact, it is not; and in other instances it is found impossible to, and some mothers *will not*, nurse their babies: hence the great number of cases where resort is had to cow's milk which, though doubtless the best substitute when properly prepared, is still a strictly natural aliment for the calf only, being much 'stronger' than breast milk, and requiring a longer time for digestion.

"Again, the little animals referred to — puppies, for example — really spend comparatively little time in eating, although it is quite true that they make a great to-do about it, and do devote quite a share of their waking moments to *efforts* in this direction: (*a.*) A great portion of the time, when they appear to be quietly regaling the 'inner dog' with their 'favorite prescription,' a close inspection discloses the fact that, with their noses simply buried from sight, they are sleeping, and not eating. (*b.*) Another goodly portion of time is spent in a blind hunt for the nipple, in rolling about, in 'ground and lofty tumbling,' pushing, pulling, crowding, and badgering one another, each in the notion that the other has found it and is getting ahead of him, and in the effort to steal his brother's dinner. (*c.*) They spend a good deal of time in vigorous efforts after the supply is exhausted; they shift from one nipple to another, and 'when they get there, the cupboard is bare.' Thus they manage to take a great deal of exercise, while getting comparatively little milk. Finally, while the supply is usually equal to their needs, it seems never to be in excess, — *diet* and *exercise* being so well related to each other that the entire organism is normally developed.

"How different with babies! These, supplied from a full breast or bottle, fill themselves quickly and without effort, — surely a contrast worth considering, more especially since the contrast in their physical condition is equally marked: lean and healthy in the one case; fat and ailing in the other. It is true that when the natural diet is supplemented with cow's milk, or when they are weaned and are fed to excess, puppies are made ill, — have fits, that are attributed to their having 'swallowed a tooth' (of the size of a pin-head), instead of to the gross diet supplied; but as a rule they are rarely sick, and never have the disease so common, almost universal, in infancy, and so much dreaded in adult life, — fatty degeneration. Appearances are often deceptive: a novice who will take the trouble, however, to examine the fattest-looking kitten or puppy, will be surprised to find him made up of a very bony frame, muscles, tendons, and over all a *loose* skin, in no degree stuffed out with fat. As a rule — I have never observed an exception — the nurslings of animals are *never* fat, never even border upon that state; while human parents are never quite satisfied unless their babies' cellular tissues are storing up fat globules at the rate of a pound a week, an invariable precursor of — disease, shall I say? It *is* disease, and almost inevitably culminates in a sickness that robs them of the fat, if not of life. From a careful consideration of these points, it would seem that what nature alone accomplishes in the case of the young of the lower animals — normal growth and exemption from disease during the nursing period — demands, on the part of parents and attendants, the exercise of rare judgment, as well as care, in the alimentation of their little charges, in order to secure anything like the same happy results.

"Physiology teaches — and this in conformance to an universal law of nature — that the digestive fluids are secreted from the blood in proportion to the needs of the system for food, and not in proportion to the amount of food swallowed; there is, therefore, a *normal dyspepsia* for whatever of excess is taken. Moreover, in proportion as the normal amount is exceeded will indigestion affect injuriously *all* of the food ingested. The absorption into the circulation of the products of indigestion constitutes *blood poisoning*, and is a prevalent source of sickness. Headache, languor, feverishness, lack of appetite, and almost innumerable ailments arise from this cause; and the breathing of vitiated air in insufficiently ventilated living and sleeping rooms increases the evil many fold."

CHLOROFORM-WATER.

The *Gazette des Hôpitaux* describes a highly useful preparation of chloroform for internal use, made by the simple addition of water. Professors Lasègue and Regnauld have shown by careful investigations that this is the only preparation of the kind that can be depended upon: and that the solubility of chloroform in water does not exceed nine parts in a thousand. The method of obtaining the solution and its therapeutical uses are thus stated: —

Chloroform-water is prepared by pouring an excess of chloroform into a bottle three parts full of distilled water, shaking the mixture repeatedly, and then allowing the insoluble chloroform to deposit, until complete transparency is obtained. The separation of the saturated solution is then made by decantation, or by means of a siphon. This, how-

ever, being too strong for internal use, requires dilution with 9 parts per 1000 of its weight of water. Various salts (as chlorate of potash, borate, bicarbonate, and salicylate of soda) may be dissolved in this water without producing any modification; and Professors Lasègue and Regnauld are of opinion that, either pure or diluted, it will meet every need of the internal administration of this substance. Giving a pleasant taste in the mouth, which lasts for a minute or two, it is well calculated to disguise the taste of various medicines, as castor oil, etc.; and by the direct action which it exerts on the mucous membranes and other surfaces with which it comes in contact, it may prove useful in certain affections of the mouth, gums, teeth, velum, and pharynx. Swallowed, it exerts a stimulant action on the stomach, but it acts differently according as it is taken before, during, or after a meal, and according to the time that has intervened since taking the meal. Given before a repast, in aid of the appetite, the chloroform-water is a bad agent; but given after a meal, whether alone or combined with an alcoholic wine and sweetened, it increases the stimulant properties of the wine or produces the same effects. • It has an incontestable efficacy in combating the multiple affections which cause disturbance during the course of digestion. Its maximum therapeutical action is obtainable three or four hours after the meal, when functional disturbances exhibit themselves by distention, gaseous eructations, a sense of epigastric pressure or heaviness, flushings of the face, and threatenings of vertigo. But when the digestive disturbances are manifested by acute lancinating pains of the stomach, oppression, palpitations of the heart, fleeting febrile action, dryness of the mouth, painful tympanites, etc., the action of the chloroform-water is injurious, this period of the indisposition being ill-suited for any stimulant whatever. In a word, the chloroform-water acts on the stomach in the same calming way as upon the interior of the mouth, and if it do not cure the affection, at least it mitigates its consequences. It is the remedy for the crisis, but not dispensing with the requisite principal treatment.

TEA AND COFFEE AS NERVINES.

Dr. Lewis Shapter, in *The British Medical Journal*, writes as follows on the value of tea and coffee as nervines: —

The only restoratives to the nervous system which have stood the test of time, popular acceptation, and practical usefulness are infusions of tea and coffee, and such like beverages. It needs no medical knowledge to speak of the increased sense of respiratory power and muscular vigor; the promotion of general comfort and warmth; the cooling of the body, the result of the slight increase of perspiratory functions; and the general restorative feeling when the body is overcome with fatigue, which is so generally and justly attributed to the use of tea, or, as will be presently shown, its active principle, theine, in the daily experiences of life.

Failing, however, popular acknowledgment, medical and scientific research point to one and the same conclusion, that infusions of tea and coffee are restoratives to the nervous system, and indirectly act as sustainers to the circulation. Chemistry has shown that this action is dependent not upon the multiple constituents of the infusion of the leaf and berry, not upon any complex association of materials, but simply and entirely upon the presence of one substance, — theine, — which is the active and essential principle of all these and allied substances, and is known to us in the form of silky prismatic crystals, soluble in water. The quality of tea or coffee is, therefore, properly determined by the percentage of theine it contains, which varies from three to six per cent., and not by the delicacy and fullness of flavor which is imparted by the volatile oil. Medically speaking, this theine has a totally distinctive action from the infusions of which it forms a part. In the form of an infusion of tea or coffee, we have to deal with a large proportion of astringent matter, in the form of tannic acid, and with the presence of the essential oil, which is an excitant to the nervous system, and is the substance to which must be ascribed disorders of the nervous system which result from tea-drinking, such as palpitation of the heart and sleeplessness. The theine, upon the other hand, of which there is about one tenth of a grain in an ordinary cup of tea, is the restorative agent to the nervous system, and is opposed, in its therapeutic properties, to the action of the essential oil. The infusion, therefore, of tea may induce palpitation in a heart liable to excessive or incoördinate action; but theine, on the contrary, may be looked to, therapeutically, to quiet palpitation. The infusion, by being an excitant, may prevent sleep. Theine, by being a restorative and an indirect sustainer and regulator of the circulation, may induce sleep. Individual medical investigators have, more than this, attempted, from time to time, to show that the action of theine is allied to that of quinine, as, in medicinal doses, the one has proved curative in allied diseases as well as the other; and, moreover, that the nutritive value of theine may bear comparison with that of kreatine, one of the principles of meat.

All this is sufficient to show that theine is already a tried and proved agent, with a recognized dietetic position; and, if it has not hitherto occupied a place supplanting the use of alcohol, it is because (1) it has remained unrecognized as the active and essential principle upon which all the good qualities of tea and coffee, as restorative beverages, really depend; and (2) it has not been presented to the public in a form which would tend to render it acceptable or agreeable. In the form of an aerated water, theine offers the means of supplanting the abuse of alcohol. It forms an agreeable beverage, imparting a somewhat dry flavor to a distilled water, which may be sweetened and flavored to taste, and it offers a means for awakening scientific thought to the study of a simple remedy for a national abuse.

CLEANING DRUGGISTS' UTENSILS.

The following practical hints from a writer in the *Druggists' Circular* will be useful not only to pharmacists, but to chemists in general, and everybody else who has occasion to clean utensils that have been used in compounding drugs or preparations containing drugs: —

Before cleaning an implement, the first thing to consider is whether the vial or article you are about to wash is worth the chemical you will have to waste upon it. If not, then throw it away; if otherwise, the chemicals are not wasted. Do not count the labor, as it would be the same even if merely washing with water. On any article use water first, — pure water, or as pure as it runs from the hydrants. . . . Soap is incompatible with a great many chemicals employed in a drug store, and in some cases had better be left out altogether. Water will dissolve out most iodides, nitrates, sulphates, chlorides, etc., with which soap is incompatible, even if they are incorporated with fatty substances, as in ointments. . . . Powdered pumice stone is an excellent thing for scouring wedgwood mortars and brightening spatulas. It is also useful when introduced into bottles on paper and a bent wire employed for scouring.

Dry sawdust is good for removing grease from mortars and spatulas after ointments have been made, and in soaking up oil and paint from floors when spilled. Sand brick is useful in scouring spatulas. Shot for washing bottles I *do not* recommend, not so much from fear of lead poisoning, but because there are better methods for the same purpose, and less expensive. Shot that has been thrown into a greasy bottle becomes coated with fat, and is unfit for further use, as it will only dirty the next bottle it is thrown into. The shot itself, when once dirty, is hard to clean, and had better be thrown away. A very handy instrument is the bent wire and paper. With a good steel wire bent into proper shape, and introduced into bottles, we can accomplish wonders. A piece of newspaper, moistened and sprinkled with powdered pumice stone, will scour out of a bottle all dirt of a resinous character. If the bottle has contained any solutions of iron salts, use hydrochloric acid. A bottle that has contained lime-water, or in which lime has deposited, is most readily cleansed by hydrochloric acid. The same is true of oxide of zinc when used in a mortar for making ointments. A mortar, after zinc ointment has been prepared in it, if washed ever so much with soap and water, still causes a little water dropped into it to run into globules, showing the presence of zinc or other substance in the mortar. A few drops of muriatic acid dropped into it will remedy this, forming chloride of zinc, a very soluble salt.

Nitric acid will best cleanse a vessel having contained lead solutions, as the other acids form insoluble lead compounds. Carbonate of soda put into fish oil or cod-liver oil bottles, and allowed to stand a few hours, will cleanse them perfectly. A solution of crude potash is an excellent thing to keep on hand, as it is to be preferred to alcohol, ether, benzine, or chloroform in cleaning vessels having contained resins, such as liquid styrax, tolu, benzoin, and all dirt of a resinous character; it is also useful in cleaning vessels which have contained Prussian blue. Alcohol is useful in removing chlorophyl. For ether and chloroform I have no use, as they are too volatile and too expensive.

Hot water for grease is not to be recommended, because it is not handy to get, and it only melts the grease, and causes it to float on its surface, and when the water is poured out of the vessel the fat will still adhere to its sides, and have to be washed off with soap and water. Turpentine is useful in removing tar, wax, or resin. I never have had enough success with ammonia to recommend it. It destroys paint if put on counters or shelving, and makes windows look smeary. The only thing it is good for is to neutralize acids that may have fallen on your clothing. Oxalic acid will temporarily remove tannate of iron stains. Use whiting, or better, precipitated chalk on your plated show cases, and rotten stone on brass work. A chamois skin is good to brighten up things with, but a new one scratches, and an old one, if washed, is hard and stiff.

All the above solvents and detergents will do for the hands if used in moderation, and then immediately removed with clear water.

MISCELLANEA MEDICA.

Statistics about Doctors. — The Paris Faculty of Medicine has just collected some remarkable statistics relative to the medical profession. According to this authority there are in the civilized world 182,000 physicians with proper degrees. France possesses most doctors in proportion to her population, and there are few countries in which the profession takes such part in politics. In the Chamber of Deputies alone there are forty medical men, including the well-known M. Clémenceau. Then the number of the doctors who are Senators, Councillors-General, and Municipal Councillors amounts to the enormous figure of 6700. In Paris alone 250 physicians contribute regularly to the newspapers or to medical journals. One noteworthy

fact is that the French doctors live longer than those of any other country. It is to be hoped that their patients follow their example.

THE PACIFIC COAST FOR VICTIMS OF HYDROPHOBIA. — "Go West, young man," if you have been bitten by a mad dog. Dr. L. L. Dorr, of San Francisco, in the *New York Medical Journal*, says that the Pacific Coast presents some peculiar features as regards this disease; from Behring's Strait to Cape Horn, he states, not a well-authenticated case of rabies was ever known. In support of this statement he adduces testimony to which great weight must be allowed. He therefore dissents from the common opinion that climate has no influence over the disease. A test of the power of the climate of the American Pacific coast to prevent the development of rabies can easily be made, he suggests, with strong probability of proving a blessing to hundreds of human beings who have no other hope. The period of incubation is so long, in many cases, that several dogs known to be badly bitten by a dog known to be suffering with rabies could be sent there under guard, and kept behind prison-bars and under observation until the extreme limit was passed. Or a more practicable plan might be to have a number of the many persons who are annually bitten by rabid dogs in the Eastern States and Europe go to that coast, and remain there until the extreme limit of the possibilities was passed, selecting any place from Cape Horn to Behring's Strait, — preferably, however, California, where they have a varied climate and all kinds of dogs, and are in close communication with all parts of the world. The patient having a knowledge of these facts, and the support of hope of escape, it might be a power to prevent an attack; and, if he were attacked, the disease might be so modified by the climate as to render it susceptible of cure.

DRUNKENNESS IN ALSACE-LORRAINE AND FRANCE. — The increasing consumption, in Alsace-Lorraine, of the cheap, common spirits from the beet distilleries of North Germany, favored at once by three years of bad yield of white wines in the Vosges, and the high duties on French red wines, is felt to be a serious evil, drunkenness being greatly on the increase among the artisan and agricultural population. It was discussed at a recent meeting of the Society of Sciences, Agriculture, and Arts of Basse-Alsace; and the Industrial Society of Mulhouse lately offered a prize for a *brochure* to be distributed among the working classes, depicting vividly the evils of alcoholism, and tending to inspire a horror of it. In some parts of France (Normandy, etc.) disquietude is being felt on the same account. Dr. Claude attributes the rapid depopulation of Rouen mainly to the growing abuse of spirits. In the three years 1877, 1878, 1879, the excess of deaths over births in that town was, successively, 308, 438, and 1178.

A SINGULAR LEGACY. — The well-known Parisian inventor of balloons, M. Giffard, who died some time ago, has left a legacy to the French Government under most singular conditions. He desires that it be devoted to the establishment of *suicidaria*, or national institutions in which persons suffering from painful and incurable diseases may be allowed, by the use of chloroform and other such agents, to shorten their own existences, acting under the direction of medical experts, and with the consent of their friends. M. Giffard secured euthanasia for himself by a special apparatus he invented for the inhalation of chloroform.

OPIUM IN CHINA. — The *Medical Times and Gazette* gives the following relative to the consumption of opium in China, taken from the report of the Inspector-General of Customs: Only two thirds of 1 per cent., or 2,000,000 of the population of 300,000,000, choose to consume opium. The annual importation of the drug into the country amounts to 100,000 chests of 133 pounds each, about one third of which is, however, lost in its conversion into prepared opium. The home production amounts to as much as that imported, and together with it costs about £25,000,000 annually. Five drachms is the calculated average amount used by each smoker daily, and five pence to eleven pence its cost. It is claimed that the drug prevents the waste of tissue, and is to the poor Chinaman what tea is to the same class in the United Kingdom; while a protest is made against its being bracketed with alcohol in one sweeping condemnation, as the latter is only a temporary stimulant, while opium may, in time of famine, take the place of food.

SELECT FORMULÆ.

EFFERVESCING POWDER OF ROCHELLE AND EPSOM SALTS. — The following is from Mr. Fairthorne: —

Potassii et sodii tartratis	5 lbs. 10 oz.
Sodii bicarbonatis	2 lbs. 14 oz.
Acidi tartarici	2 lbs. 8½ oz.
Magnesii sulphatis	1 lb. 9 oz.

Each ingredient must be *very thoroughly dried*, powdered separately, sifted, and all the ingredients thoroughly mixed. If not well dried, the mixed powders set in a solid, unsalable mass. The taste of the Epsom salt is not perceptible.

SHAMPOO LIQUID. — The following is given in *New Remedies* as a good formula for a liquid to be kept in stock: —

Soap-bark, bruised or ground	2 oz.
Glycerine	1 fl. oz.
Cologne	2 fl. oz.
Alcohol	5 fl. oz.
Rose-water	8 fl. oz.

Digest during two days, frequently shaking. Then strain, express and filter.

Barbers usually use carbonate of potassium (salt of tartar) in the proportion of 1 oz. to the quart, sometimes combined with some carbonate of ammonium. Bay-rum, cologne, or other scented liquids may be added, according to fancy.

ANTISEPTIC COLOGNE. — The following is commended as a preparation combining antiseptic properties with a perfume: —

Eau de Cologne	8 fl. oz.
Chloral hydrate	2 drachms.
Quinine (alkaloid)	10 grains.
Carbolic acid (pure)	30 "
Oil of lavender	20 drops.

May be used as spray or on the handkerchief.

A GOOD MARKING INK. — The following is said to afford an excellent preparation: —

Aniline black	1 drachm.
Alcohol	½ troy ounce.
Muriatic acid	60 drops
Water	3 ounces.
Gum arabic	1½ drachms.

Dissolve the aniline in the alcohol and muriatic acid, and add to it the gum arabic dissolved in the water.

LIME-JUICE CORDIAL. — The following is from good authority: —

Glucose	36 lbs.
Cane sugar	108 lbs.
Water	28 gallons.
Lime juice	17 gallons.
Oil of orange	4 drachms.
Oil of nutmegs	4 drachms.
Salicylic acid	2 oz.

Dissolve the glucose and cane sugar in the water; add to the solution the lime-juice, the essential oils, and the salicylic acid. Mix well, and strain.

BILIOUS HEADACHE WITH FLATULENCE. — The following is commended for this complaint: —

Magnes. sulphat.	℥vi.
Magnes. carbonat.	℥i.
Tinct. lavand. co.	℥iij.
Aquæ menth. pip.	ad ℥viij. M.

Sig. A sixth part to be taken early in the morning, and repeated as may be necessary.

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Special Notices.

Progress of Homeopathy.

AT the recent meeting of the American Institute of Homeopathy at Indianapolis, Dr. Talbot, of Boston, read a report showing that there are 7000 homeopathic physicians and 278 institutions in the United States; 4 national societies report 1067 members; 26 state societies, 1783 members; 103 local societies, of which 66 report 2355 members; 18 clubs, of which 7 report 79 members; 23 general hospitals, of which 18 report 1268 beds; 15 of these hospitals reported having treated last year 6675 patients. The cost and value of 11 of these is $770,500. Of 30 special hospitals, 15 report 859 beds, and 9 of them treated last year 10,609 patients. The cost and values of these hospitals are $1,105,000. Of 29 dispensatories, 27 reported having treated last year 1469 patients. To these had been furnished 256,589 prescriptions. Twelve medical colleges have had 1267 students, and graduated 412 physicians this year, and 5680 since they were founded.

GOOD WORDS FOR ADVERTISERS.

DURING the hot and unhealthy summer months a good, reliable disinfectant is absolutely necessary. Billings, Clapp & Co.'s Carbolate of Lime is one of the very best, being cheap, effectual, and easily applied.

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A. L. HALL, M. D.

LOUISVILLE, KENTUCKY.

Having had a minister under my charge with Locomotor-Ataxia, I commenced treating him with CELERINA, and can say that its use has been attended with marked effect, improving his appetite and general nervous system. It is worthy of a trial by the profession in such diseases.

Yours respectfully, C. C. GODSHAW, M. D.,
Member of Louisville Board of Health.

HEALY'S VEGETABLE TONIC PILLS have been in the market many years. Their reputation has been won by positive merit, not by vulgar and obtrusive advertising. Send for pamphlet.

NERVOUS Prostration and Headaches are unknown in families where CEPHALINE is the Household Remedy.

IN writing it is well to remember the rule that the up strokes should be curves and the down strokes straight. The Esterbrook's pens will be found adapted for either operation.

GOOD WORDS FROM SUBSCRIBERS.

I have taken the JOURNAL OF CHEMISTRY from the first, and found it so valuable that I cannot fill its place with any other reading matter on my list. It has proved a success, and is needed in every family.

Very truly yours, P. L. TYLER.
JERSEY CITY, N. J.

Boston Journal of Chemistry
AND
POPULAR SCIENCE REVIEW.

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Familiar Science.

THE SUPREME MIND.

STUDENTS in science, men engaged in research, have been charged with practical atheism, and as a class are supposed by many to have no distinctive belief in a Supreme Being. This charge is groundless, in its general application, as it is true that nearly all workers in the various branches of science do have a belief in a superintending, guiding Mind, a God in nature, who acts through laws which He has established. But comparatively few believe in a personal God, corresponding with the views as presented in some systems of theology.

As a form of expression of the nature of a Divine Mind, perhaps the example of Agassiz at Penikese may be presented as typical of the prevailing view among scientific investigators. Agassiz having completed his arrangements for opening the school of natural history at Penikese Island, in Narraganset Bay, gathered his pupils around him in the building dedicated to science, and spoke to them of the great purpose which called them together. He reminded them that they were about to commence investigations into the secrets of nature; that the great plan and purpose of an Infinite Mind, as illustrated in the structure and habits of marine organisms, was about to be unfolded: and hence, he remarked, it is becoming and appropriate that we first of all bow in the presence of the Infinite One, and thus recognize his sovereignty, superlative wisdom, and beneficence. The great man then uncovered, and in presence of all bowed his head, and stood motionless and silent for the space of three minutes. It was a solemn scene, and made a profound impression upon all present. In no other instance was the philosopher known to engage in any outward act of devotion in public.

As illustrative of an opposite view of the nature of God which prevails, let us present an example of an emotional but sincere class-leader at a camp-meeting. The class-leader enters the circle of his brethren and sisters, who are overpowered with emotion equally with their leader, and falls upon his knees in prayer. As the rapid utterances flow from his lips, he glows with a fervor akin to fire. He looks *upward*, as if God were located somewhere in space (and this is really his idea); he raises his voice to a high pitch, as if Deity had special organs for hearing, and was withal a little deaf; he begs that God will *look* down and *come* down, implying that He has organs of sight and limbs for locomotion; hot arguments are employed, as if God could be persuaded to change his purposes and break his laws. How inconceivable to the thinking and cultivated is a mental status which thus brings God to the human level!

The Being in whose all-pervading presence the great philosopher bows his head in silence is the same as the one addressed by the fervid exhorter, but how different are the conceptions of that Being!

It should be noted that, whatever may be the views held, it is impossible to write or speak upon the topic of a Deity without using the personal pronouns *He* and *Him*. The poverty of language and the narrowness of our conceptions necessitate this. We have the ability of making certain sounds by the aid of tongue and lips, and the aerial waves produced flowing in upon the ear make impressions upon the soul, which impressions result in thought and language; but there is a limit to these impressions, as there is to our physical strength or to our stature. Because the terms Infinite One, Supreme Being, etc., are used by speakers and writers, it is not to be inferred that the words are intended to represent to the mind ideas of a personal God.

The view that the Deity has personality and a distinctive habitation is well illustrated in the remark of a prominent clergyman, who, when fears were expressed by some of his ministerial associates that advancing science would overturn religion, exclaimed, "For my part, I have no such fears, and I hope science will advance until telescopes are constructed of such vast powers as will enable astronomers to pierce clean through the heavens, *up to the throne of God, so that He can be seen sitting upon it.*"

The notion that Omnipotence is personified in a *form* and occupies a *throne* somewhere in space is one widely entertained, however preposterous it may appear to cultivated and reflecting minds. In order to conceive of a form, there must be some type brought before the imagination, and of course no other but that of a *man* could in any degree satisfy the conceptions, as he is the highest in the scale of creation. The Deity is therefore conceived to be a distinct personage, having a human form, but great in proportions and of superlative majesty and benignity. He doubtless appears to thousands of good people as a great king or emperor appears to the minds of children, from descriptions found in their juvenile books. The old painters were very fond of putting on canvas, in colors, their conceptions of the triune God; and it is not strange, considering their relationships to the dominant theology of the times, that they mistook the likeness of the reigning Pope for that of Deity, and put upon their ideal heads the papal tiara, and in the hand the mace, significant of authority.

Personality presupposes, of necessity, a person; and how difficult — nay, how impossible — it is for any reflecting mind deliberately and satisfactorily to think of God as a *person!* It appears to be incompatible with any rational idea of an infinite and omnipresent God. Whatever is finite is contained in the infinite, and the finite can be conceived of only in connection with an infinite beyond. The very terms measure of space, measure of time, necessarily imply a further extent of time and space beyond. And if time and space are in themselves limited, there must be more time and space beyond these limits. Now, what applies to time and space applies also to every other idea. Nothing that we can conceive of is absolutely limited; everything stretches out into the infinite, and above all things the idea of God; and though infinitude is quite unthinkable to our finite minds, we cannot shut out our consciousness of it. On these grounds it is difficult to hold belief in a personal God.

If the complaint is urged that in uprooting a belief in a personal Deity nothing is left to conceive of, or to worship, the reply may be made that this is not the view taken of the matter by reflecting minds. As the race increases in scientific culture and intelligence, the mind increases in its breadth and in its capabilities. Two centuries ago, the power of the average human intellect was incompetent to grasp and comprehend the profound and subtle facts in nature now unfolded by science. Mind in that comparatively recent age had not become sufficiently robust to discover these facts, and if accident had brought some of them to view, the power of rigid analysis was wanting by which they could have been understood and assigned to their proper place, or applied to the important uses for which they were designed. For example, even at the present day we are unable to state precisely what electrical force *is*, but the laws under which it is developed and by which it is governed are very clearly comprehended. We are unable to adopt the view that because the race in its infancy and middle-age strength required *object* teaching, the

maturer mind, when put to its best, cannot dispense with that form of instruction. The form of language employed in Scripture to represent Deity could not have been different from what it is, and at the same time afford any notion whatever of a Supreme Mind to those living in the cradle epoch of the world's history. If a revelation to man had been reserved until the present time, whilst the language employed might have been much as it is, the general tenor and force of description and narrative must have been greatly modified.

WORLD-MAKING.

Professor Alexander Winchell, LL. D., of the University of Michigan, well known as one of the ablest geologists in this country or any country, and the author of several valuable works on topics connected with his favorite science, has been giving a series of popular lectures before the Martha's Vineyard Summer Institute, of which Mr. W. J. Rolfe is president. We are enabled to present our readers with the following abstract of the first of these lectures, and as it has been revised and approved by Dr. Winchell, it may be considered an authoritative epitome of his views on the origin of our planet and of the solar system: —

This subject may seem too vast and too difficult for any finite intelligence to discuss. But we have adequate reason for believing that the general tenor of events has been the same in ages long past as in modern times. The forces of nature have not changed, and their modes of action must be admitted the same in all ages and in all regions. We may therefore gaze from the eminence to which science has lifted us upon the stream of passing events. We may look onward toward its final issue; we may look backward toward its sources. Thus the most familiar phenomena and the most commonplace events possess a profound significance; for they indicate *tendencies* and *bearings* of the course of terrestrial history, which point toward conditions of things in the remote past. Thus many indications lead to the conclusion that the surface of the earth was once in a heated condition, and that a process of cooling has taken place. The very stones which line our beach were hardened and vitrified by heat. They came from the vast formations of granite and syenite and schist which underlie a large part of New England, and which, though once fresh sea-sediments, have been hardened and crystallized by heat and other agencies. Wherever the basaltic column builds its wall of palisades; wherever the broad sheets of ancient lava, emptied through deep fissures in the solid earth, overspread their thousands of square miles, as along the Pacific slope of our own country, there are proofs of an ancient heat which sufficed to fuse the very rocks. From those times to these a great subsidence of surface temperature has occurred. The world has been cooling. But the heat is not extinguished. The artesian auger, and the sweltering discomfort of laborers in deep mines, and the hot springs of the world, and the flames and lava thrown from the craters of volcanoes, all testify to the existence of some vast reservoir of heat within the cooled surface of our planet. All indications point to the former prevalence of a high temperature, and to the escape of vast quantities of heat through a process of cooling. Even observation and measurement, let it be added, verify the induction from the data cited, by showing that the measured aggregate of heat received by the earth annually, from all sources, is less than the total radiation. Thus the cooling process continues. From what condition of the world's matter did the cooling proceed? Beneath all the stratified rocks, and the rocks originally stratified by deposition as sea-sediments, exists, as we have reason to believe, a bed of rocky material, which resulted directly from the cooling of molten matter. We conclude that there was a time when all the rocks were molten, and the whole earth was a molten sphere. Was this the beginning of the process of cooling? No reason can be assigned for assuming it. At a temperature higher than that which fuses, all matter is capable of volatilization. What prevents us from concluding that the great terrestrial globe once existed at that higher temperature which held all its substance in the condition of an incandescent vapor?

But if the matter of the earth once existed as a vapor, we must affirm the same of all the planets of our system. They are bound together by so many common conditions that the strongest presumption exists that they have had a common origin and common history. Conceive, then, the whole mass of the solar system — planets, satellites, and sun — as existing, at a very remote period, in one mass of fiery vapor. We cannot affirm that even this was the remotest condition, but we may assume it as a starting-point in a process of evolution. It was a mass of matter intensely heated, and was in a state of rotation; but we cannot pause here to explain the grounds for these assertions. It radiated its heat into space; it contracted, and by virtue of a physical principle its rotation was accelerated as its diameter diminished. It began to flatten at the poles, and become protuberant about the equator. At length, with ever-increasing rotational velocity, the centrifugal tendency at the equator became equal to the central attraction. Then, as further contraction took place, an equatorial belt of matter was left behind as a rotating ring. This, through the influence of external perturbations, was broken, and all its matter gathered in a globe destined to become a planet.

The great mass repeated the process of ring-making, and in the course of time all the planets of our system had come successively into existence. The sun remains to-day the residual mass, and testifies to the gaseous condition of that primeval matter out of which the planets sprang. The sun then appeals to our intelligence and senses as the historian of a past inconceivably remote.

But we must trace the further history of one of the planetary masses, like the earth. On its own part it detached a ring, which became our moon. It was then too far cooled to detach another ring, as Jupiter, a vastly larger mass, had done. It had begun to pass from the fire-mist stage to the condition of a molten globe. Drops of mineral rain descended to the centre, and a liquid sphere came by degrees into existence. Thus it grew until the fiery clouds were exhausted. The sun was even now shining on the molten self-luminous earth. But it continued to cool. Next in the order of events was the formation of a solid crust over the terrestrial surface. But it remained at a glowing temperature.

In the course of further ages, the vapor of water began to condense in the upper regions of the heterogeneous atmosphere. All the water of the ocean still existed there as an invisible gas. The forming clouds thickened to a dark pall. Sunlight was excluded, but the gleam of the fervid rocks was reflected from the vault of the watery canopy. Rains descended, lightnings blent their light with the lurid glow of the burning crust, and responsive thunders reverberated through all the vault of the clouds. The rainy torrents struggled toward the earth. They reached the fiery crust, and after a prolonged conflict gained possession, and covered the earth with a film of ocean waters.

In these waters was waged a long conflict between the forces of chemistry. Beds of sediments were thrown down. When a quieter time arrived humble plant-forms were seen in existence. A new twilight dawned as the clouds became exhausted, and at length the sun shone again full on the face of the darkened planet, and penetrated the depths of new-formed ocean.

The records of these times are preserved in the forms of the enduring rocks. Geological science has taken up the theme, and on the pages of the text-books may be found the continuation of terrestrial history.

HOW TO DRY PLANTS.

Mr. Leo H. Grindon, whose name is well known in scientific circles, gives the following practical hints on this subject in a recent article in *The Field Naturalist*, of London: —

The very ancient adage that if a thing be worth doing at all it is worth doing well applies to the preservation of plants for the herbarium as much as to any great and important work or business. Specimens that are no better than fragments of brown stick, or that seem effigies of plants cut out of thin brown paper, the flowers shrivelled and shrunk so as to be no longer intelligible, the leaves crumpled and doubled up, everything confused and mashed together, such as one may see sometimes in collections, are altogether undeserving of the name. Nothing that is not dried in the best manner possible — its colors and configuration preserved as perfectly as the nature of the plant will admit — ought ever to be allowed a permanent place in the herbarium. The bad may be tolerated a while, in default of better, but the further a specimen is from vivid and pleasing resemblance to the living thing, the speedier should be the endeavor to supersede it. Specimens from abroad that cannot be superseded of course we do not speak of. In the case of plants within reach, none but admirable representatives of their best features while alive should be considered worthy of a place. Plants dry very variously. Some require not a moment's trouble; others demand patience. Now and then the case is hopeless, and we are constrained to fall back upon the pencil, and prefer drawings, colored ones if possible. Grasses and their allies, most kind of ferns, plants that resemble heather, "everlastings," the mature leaves of shrubs and trees, call for only the minimum. Those which try the patience, and can be managed only after considerable experience with easy ones, are such as may be illustrated by citation of the hyacinth. To secure the best results, obtain first half a dozen pieces of stout millboard, cut to about eighteen inches by twelve. Then gather together a hundred old newspapers, and fold them neat and square to about the dimensions of the millboards. Four or five yards of common white cotton wadding, a score of sheets of tissue paper and as many of blotting paper, all cut to the same size, complete the apparatus. One of the boards serve for the foundation; on this lay a newspaper, then a piece of wadding, and upon this place the specimen intended to be dried. The cotton being soft and retentive, every portion can be laid in a proper and natural way, including the petals of the flowers. A newspaper above, two or three if the specimens have thick stems, and so on, till all shall be deposited in the way of the first. If the specimens are sticky, or hairy, or of a kind that the wadding seems likely to adhere to, then, before depositing them on it, introduce a half sheet of the tissue paper. A heavy weight must be put on the top of all, sufficient to imbed the specimens in the wadding; then leave the whole to rest for twenty-four hours. All the papers must then be changed, dry ones being put in their place; and if the plant seems to throw off a very considerable amount of moisture, such as will render the wadding quite damp, change the wadding also. A second and even a third change is desirable, at the end of two or three days or a week; and when this is made into

duce the blotting paper, pressing again till everything is perfectly flat, and the specimens are absolutely dry.

Such is the simple process by which the writer of these lines has succeeded in the art of preserving the colors and forms, not only of robust and tractable plants, but of the most delicate and very many of the obdurate. Every petal, every leaflet, retains the form it had in life, and nine specimens out of ten keep their colors excellently. To insure the keeping of *color*, it is well, if time can be spared, to change the blotting paper many times, and to dry it thoroughly before the fire, but this need not be done till after the third day from the beginning.

WHAT A BLIND MAN SEES.

The French scientist, Plateau, who for the last forty years has been totally blind, has just published a little paper on the sensations which he experiences in his eyes. He states that he has constantly in his eyes the sensations of light; his field of vision is divided into spaces, of which some are very clear, and others sombre or almost black. These spaces are not precisely limited, but run into each other at their borders; but what is remarkable is that their general tint alternates between gray and reddish. For example, if it be gray M. Plateau perceives now, in a few hours it will be red; then, a few hours later, the gray again, and so on. The reddish tint is that obtained by mixing pale rose-color, or rather flesh-color, with a certain quantity of black. The relative arrangement of these different spaces is always the same, but the intensity of their tints varies. The central space shows itself sometimes very clear, and sometimes very sombre; above and below, as far as the limits of the visual field, there is sometimes clearness, sometimes obscurity. It is the same with the space to the left; there is generally a vertical, almost black band, and the space to the right of that, as far as its limit, is almost always clear and ruddy. These appearances seem to M. Plateau to fill the whole extent of his ordinary visual field. He believes the distance at which they are is small. These same appearances follow all the movements of the eyes, as if they resulted from a modification of the retinas. It appears to M. Plateau that the two eyes do not participate in the same manner in the tints in question; but he is absolutely incapable of distinguishing what belongs to the one from what belongs to the other. He has not been able to establish any coincidence between the changes of the general tint and the work of digestion.

THE WONDERS OF AN ATOM.

All things visible around us are aggregations of atoms. From particles of dust, which under the microscope could scarcely be distinguished one from the other, are all the varied forms of nature created. This grain of dust, this particle of sand, has strange properties and powers. Science has discovered some, but still more truths are hidden within this irregular molecule of matter which we now survey than even philosophy dares dream of. How strangely it obeys the impulses of heat; mysterious are the influences of light upon it; electricity wonderfully excites it; and still more curious is the manner in which it obeys the magic of chemical force.

These are phenomena which we have seen; we know them, and we can reproduce them at our pleasure. We have advanced a little way into the secrets of nature, and from the spot we have gained we look forward with a vision somewhat brightened by our task; but we discover so much yet unknown that we learn another truth, — our vast ignorance of many things relating to this little grain of dust. It gathers around itself still other particles; they cling together, and each acting upon every other one, and all of them arranging themselves around the little centre, according to some law, a beautiful crystal results, the geometric perfection of its form being a source of admiration. It quickens with yet undiscovered energies; it moves with life; dust and vital force combine; blood and bone, nerve and muscle, result from the combination. Forces which we cannot, by the utmost refinements of our philosophy, discover direct the whole; and from the same dust which formed the rock and grew in the tree is produced a living and a breathing thing, capable of receiving a divine illumination, of bearing in its new state the gladness and the glory of a soul.

SCIENTIFIC BREVITIES.

A Salt-Mine Two Thousand Years Old. — A mine has been found in the mountain near Salzburg, Austria, which gives indications of having been occupied and abandoned at least two thousand years ago. It contains a large and confused mass of timbers, which were used for support, and a number of miners' implements. The timbers were notched and sharpened, but were subject to an inundation, and left in confused heaps. The implements were mainly wooden shovels, axe-handles, etc. Among the relics, also, was a basket made of untanned rawhide, a piece of cloth woven of coarse wool, the fibre of which is very even, and still in good preservation, and a torch, bound together with flax-fibre. The probabilities are that the ancient salt-miners were overtaken by the flooding of the mine, as mummified bodies have been discovered also. The find seems to have belonged to the pre-Roman times, as the axe-handles were evidently used for bronze axes, specimens of which have been found upon the surface of the mountain. The relics are of a high order, the basket being superior even to some that were used in the early historic times.

The Cola Nut. — What the leaves of the coca (*Erythroxylon coca*) are to the South American, the nut of the cola (*Cola* or *Sterculia accuminata*) are said to be to the West African. Weston, the American pedestrian, was, we believe, the first to bring into practical public notice the uses of the coca leaves, although their alleged properties had previously been described by scientific writers. These properties are now said to be possessed equally by the cola nut, the seeds of a tree indigenous to the West Coast of Africa. The seeds are about the size of a pigeon's egg, several of them being contained in a single husk. The nut is eaten by the natives, who declare that it has the power of satisfying for a considerable period the cravings of hunger, and of stimulating them to withstand prolonged labor without fatigue. The nut, which is of a bitter flavor, is also said to act like olives in enhancing the flavor of whatever may be eaten afterwards. If the virtues attributed to the nut are really possessed by it, it would be an advantage to introduce its use among the working classes, who require some stimulus to increased exertion when, as we heard recently from Australia, they are ready to strike for higher wages than twelve shillings for eight hours' labor a day.

The Preparation of Pure Nitrogen. — In a paper read before the Chemical Society of Great Britain, Dr. Flight mentioned that he was quite unable to remove the last traces of oxygen from atmospheric air, either with phosphorus, potassium pyrogallate, hyposulphites, an alloy of 2 parts of potassium and 1 of sodium or metallic copper at a red heat. In all cases the nitrogen contained oxygen, and developed a brown color in potassium pyrogallate. He was able, however, to remove the oxygen completely by passing the gas over a large surface of ferrous hydrate freshly precipitated by adding a strong solution of 80 grams of caustic potash to a solution of 200 grams of ferrous sulphate.

Tooth Powders and Sore Mouths. — Even such an apparently harmless article as precipitated chalk is liable to injurious contamination. It is made by precipitating solution of calcium chloride with slight excess of sodium carbonate. If the precipitated chalk be not thoroughly washed the excess of soda carbonate will remain. Tooth powders made with this poor chalk very frequently cause their users to have sore mouths.

To test the chalk for this impurity, shake with water, and after a few minutes filter. The clear filtrate should have a neutral reaction to litmus paper. If alkaline, treat a portion with solution of barium chloride; a white precipitate nearly all soluble in nitric acid shows the presence of alkaline carbonate. If another portion of the clear filtrate gives a white precipitate with oxalate of ammonium that is insoluble in acetic acid, the presence either of hydrate or chloride of calcium is indicated. The presence of chloride may be shown by formation of a white precipitate insoluble in nitric acid, with solution of nitrate of silver.

Easy Tests for Glucose in Sugar. — To detect glucose in sugar is no difficult thing for the chemist, but there is a demand for tests which any person can readily apply. The well-known chemist, Mr. P. Casamajor, suggests two methods of this popular kind. It has been found that a saturated solution of starch sugar in methyl alcohol will readily dissolve the cane sugar, but not starch sugar so that in order to test any sample for this adulteration it is only necessary to prepare such a solution and pour it upon the suspected sugar. If it is pure sugar it will entirely dissolve, but if starch glucose is present the latter will remain as a white, chalky sediment. The other process is still simpler, and has not yet been announced in the scientific papers. We have only to examine a few grains of sugar and of starch glucose with a low-power microscope to observe at once a great difference between them. The cane sugar is distinctly crystalline; the crystals clear, shining, and transparent, resembling rock candy. The particles of starch glucose are dull, opaque, and have been aptly described as resembling pieces of tallow. It certainly would not require five minutes to determine by the microscope whether or not a specimen contained starch sugar.

Hindu Plan of Purifying Rooms. — Dr. Fred. J. Mouatt, formerly Professor of Medicine in the Medical College at Calcutta, says in a recent lecture: The Hindus of every part of India with which I am acquainted have from time immemorial possessed a means of purifying the atmosphere of their rooms and huts, by spreading a light coating of a mixture of earth, containing organic matters, on their walls and floors. The process is called "leoping," and is usually performed by the women of the household. With a view to submit this proceeding to a practical test, I had four cells in the Presidency jail of Calcutta, each containing 480 cubic feet of air, and practically unventilated, carefully prepared. Two of them were lime-washed throughout, and the two others "leoped." I had four healthy prisoners locked up in them at night, one in each cell. On opening the cells next morning, the two which were lime-washed were stuffy and offensive, redolent of the peculiar animal odor exhaled by native prisoners in such circumstances. The two others were as fresh and as pure as if no one had slept in them.

Magic Photographs. — So-called "magic photographs," in which the image is developed by tobac-

co-smoke, have been lately supplied in various tobacco-shops in Continental Europe. A cigarette mouthpiece is provided, and with it are some white photographic papers about the size of a postage-stamp. One of the latter is placed over a lateral orifice in the mouthpiece, and a sliding piece drawn over it. After smoking one finds the image on the paper. *La Nature* explains the process. A small photograph, prepared on chloride of silver paper, as usual, but without intensifying, is put in a solution of bichloride of mercury, where it pales and disappears. The bichloride of mercury changes the photograph partly into white chloride of silver, and partly into protochloride of mercury, also white, making the image invisible. The image may be brought back by action of hypochlorite of soda, or of ammoniacal vapors. Tobacco-smoke, as containing the latter, does very well. The principle of magic photographs was indicated by Herschel in 1840.

HOUSEHOLD HINTS.

To Clean Marble. — Mix one quarter of a pound of soft soap with the same of pounded whiting, one ounce of soda, and a piece of stone blue the size of a walnut. Boil these together for fifteen minutes, and then, while hot, rub it over the marble with a piece of flannel, and leave it on for twenty-four hours; then wash it off with clean water, and polish the marble with a piece of coarse flannel, or, what is better, a piece of an old hat.

Pickled Cucumbers. — To pickle small cucumbers, pack them in a jar or tub, pour a weak brine on them, and let it stand three days. Then pour off the brine and rinse the pickles thoroughly; put them back in the jar, and pour over them boiling hot vinegar enough to cover them; then let them stand twenty-four hours. Reboil the vinegar, and pour on as before, repeating the process again on the third day. Then throw away the pickle, and add fresh vinegar enough to cover every cucumber, adding a lump of alum the size of a marble to each gallon of vinegar, together with one half pound of sugar, and spices to suit the taste. Bring to a boil, — not in brass, — skimming thoroughly, and pouring over the pickles while hot. Let them stand well covered. Peppers, either green or ripe, improve these pickles.

Mixed Pickles. — An excellent recipe for mixed pickles is one peck of green tomatoes, half a peck of onions, one pint of grated horse-radish, half a pound of white mustard seed, one pound of ground mustard, half a pound of unground black pepper, three or four green peppers, one ounce each of cinnamon, cloves, and turmeric, and two or three heads of cauliflower; tie the pepper, cinnamon, and cloves in a thin muslin bag, place in a tin or earthenware dish, cover with vinegar, and boil until tender; can while hot in glass fruit jars. These are fully as good as the ones sold by grocers, and much cheaper.

Preserving Yeast. — The following has been recommended in the *Chemical Review*: "The thick portion of the yeast is filled into a champagne bottle, and on top of it is poured about 2½ cm. of olive oil. The bottle is then closed by tying a bladder over its top, and in order to protect it from explosion a pin is put through the bladder. So the yeast will keep well for a long time if kept in a cold place. Yeast, if mixed with about one eighth of pure glycerine, also keeps well for some time, if kept in a cool place."

To Collect the Odors of Flowers. — Roses, and all flowers containing perfumed oils, may be made to yield their aromatic qualities by steeping the petals or flower leaves in a saucer, or in a flat dish of water, and setting it in the sun. The petals should be entirely covered with the water, which should be soft or rain-water. A sufficient quantity must be allowed for evaporation, and the vessel should be left undisturbed a few days. At the end of this time a film will be found floating on the top. This is the essential oil of the flower, and every particle of it is impregnated with the odor peculiar to the flower. It should be taken up carefully and put in tiny vials, which should be allowed to remain open till all watery particles are evaporated. A very small portion of this will perfume glove-boxes, apparel, etc., and will last a long time.

To Get Rid of Mosquitoes. — It is stated by a writer in *Nature* that quassia-water is a protection against the attacks of these sirenic insects. He tried a weak solution on a child's face, which had become grievously tormented, and it worked to a charm, preventing the gray-backed suckers from dining on the baby's rosy dimples. All that is necessary is to moisten the face with the solution of quassia. It should be weak for this purpose, for a strong solution of quassia is an active poison to flies, sugar being mixed with it to attract them; but it is not powerful enough to kill the insects very quickly.

Practical Chemistry and the Arts.

INSTANTANEOUS DRY-PLATE PHOTOGRAPHY.

It may not be generally known that instantaneous photographs can be taken by almost any one, but such is now the fact; and within a few years it is hoped that every one can make views instantly, with such degree of excellence as his artistic ability, coupled with practice, will admit. The superiority of a view taken instantaneously — that is, in the fraction of a second — over one of longer exposure is that all movements of foliage and other objects affected by the wind and the uncontrollable movements of animals are nullified. The exposure of the plate in the camera is so short that all things are virtually at a stand-still, and sharply defined in the picture; whereas, in the exposure of a plate longer than one second, the movement of the object causes the picture to become blurred and worthless.

The old way of removing a cap from the front of the lens and replacing it by hand is too long an operation, and a mechanical arrangement is now substituted. The "drop shutter," the simplest form of this contrivance, consists of a slide of wood or metal actuated by a spring and held and liberated by a trigger; an opening in the slide passing over the front of the lens opens and shuts it in time, varying with the length of opening and strength of the spring. Except in case of swiftly moving objects, such as railroad trains, machinery, horses, etc., the time occupied in the passage of the slide is short enough, but for rapid work nothing will do but a shutter operated by electricity, which takes no time at all.

It will be seen by a simple calculation that a photograph of a horse at full speed, say forty feet per second, which is one mile in two minutes and twelve seconds, would have to be made in less than one seven-thousandth part of a second, to produce anything like a clear negative, and then the horse would have moved more than one sixteenth of an inch; and a railroad train going at the rate of a mile a minute would require a shutter to operate in less than one fifteen-thousandth of a second to obtain a like result. But the sensitiveness of the plate must keep pace with the rapidity of the shutter, and therefore in the manufacture of the plates the object aimed at is rapidity, coupled with depth of detail. And now the maker of lenses enters the field in the race, and vies with his competitors in forming combinations of lenses that will give the greatest amount of light (and hence rapidity), together with focal depth. As it stands to-day the shutter leads, thanks to electricity; the plate comes next; and we are hoping for the lens to complete the trio. But for aged persons, children, horses, cattle, pet animals, etc., the drop shutter is quick enough, and simplifies the "taking" of such objects as have long been the dread of photographers. It insures a clear picture, and, as applied to portrait photography, the catching of the delicacy of expression that cannot be held for so long a time as used to be required to make a portrait by the old wet-plate process.

SUBSTITUTES FOR WHITE PINE.

The *American Architect* has the following editorial note on this subject: —

The announcement, made by authority of a Government Bureau, that the white pine forests of the United States would, at the present rate of consumption, furnish less than twelve years' supply of that indispensable timber, although copied into most of the papers, has not received the general attention which it deserves, and probably will not until the advancing cost of pine lumber brings the lesson forcibly home to the public mind. This advance has, however, already begun, the price of pine land in the great timber-producing States having doubled within a few weeks, and the question of the employment of some other material for the coarser uses of building is earnestly discussed among architects and contractors. On some accounts the substitution of hard wood for pine in the finishing of houses would tend to promote their solidity as well as their artistic interest, both of which are compromised by the universal habit of using hard wood only in the form of veneers or casings upon grounds of cheaper material; but a decided progress will have to be made in the art of seasoning and working the timber of deciduous trees before it can be used in large pieces in a way to satisfy those accustomed to the straightness, smoothness, and unvarying character of pine. For framing, spruce and hemlock, with whitewood in the Southern and Middle States, will probably soon occupy the field entirely, and the makers of laths and shingles will perhaps transfer their industry to the forests of hemlock or arbor-vitæ. For interior finish, ash, oak, including many kinds now rejected, chestnut, black birch, walnut, and elm may be turned to good account; while for exterior work the deciduous varieties will probably be introduced before long, for the sake of variety, if not of economy, and with them a style of design different from that now practised, to which they are totally unsuited.

FIRE-PROOF PAPER, INK, AND PAINTS.

It appears that the effort to manufacture a fire-proof paper and ink for either writing or printing purposes has recently met with success in Germany. Paper possessing fire-proof qualities was made with chemically-treated asbestos fibre and ground or finely divided wood fibre. Ninety-five parts of asbestos were used with five parts of the wood fibre, and by aid of glue, water, and borax were made into a pulp, which yielded a fine, smooth paper, which could be used for writing purposes. It had the unusual quality of sustaining the influence of a white heat without injury. Fire-proof printing and writing inks were made by combining platinum chloride, oil of lavender, and lamp-black and varnish. These ingredients produced a printing ink, and when a writing fluid was wanted Chinese or India ink and

gum arabic were added to the mixture. Ten parts of the dry platinum chloride, 25 parts of the oil of lavender, and 30 of varnish are reported by a local writer to yield a good printing ink of this valuable kind when mixed with a small quantity of lamp-black and varnish. When the paper printed with this compound is ignited, the platinum salt is reduced to a metallic state, and becomes a coating of a brownish-black color.

A free-flowing ink for writing on the fire-proof paper with an ordinary metallic pen may be obtained by using 5 parts of the dry chloride of platinum with 15 parts of oil of lavender, 15 parts of Chinese ink, and 1 part of gum arabic, adding thereto 64 parts of water. When the paper is ignited, after being written upon with this ink, the platinum ingredient causes the writing to appear transparent, and, as a consequence, it is claimed that such writing as has become black or illegible will become readily legible again during the process of heating the paper.

Colors for painting may also be made fire-proof by mixing commercial metallic colors with the chloride of platinum and painters' varnish, adding an ordinary aquarelle pigment to strengthen the "covering power" of the color. These fire-proof paints or colors can be easily used in the same manner as the common water colors, and it is claimed they will resist the destructive influence of great heat quite as successfully as the fire-proof printing and writing inks above referred to.

INDUSTRIAL MEMORANDA.

Cleaning Horses by Steam. — In the stables of the Third Avenue Railroad in New York, a machine worked by steam has superseded the curry-comb. Its regular rate is ten horses an hour, but, in testing its speed the other day, one horse was actually cleaned in one minute and fifteen seconds, and more thoroughly than by the ordinary process. The horse is led under a bar, from which depend on each side of him arms with universal joints. Turning on the arms are brushes a foot in circumference. These are revolved by steam through the arms and cross-bar at an ordinary rate of 800 revolutions a minute, which can be increased to 1000. A man on each side takes hold of the arm close to the brush, and applies the brush to the horse. The steam that whirls the brush makes a noise a good deal like the hissing of a hostler. The universal joints allow the arms and brushes to be moved in any direction. Beginning at the head, the men move the brush along the sides, back, and belly, and down the legs of the horse to the feet. A cloud of dust arises in the air, and in two minutes the horse looks like a different creature. The horses were a little nervous at first, but after a few seconds all appeared to be pleased with the operation. At the Third Avenue Railroad stables it takes six men thirteen and a half hours to clean, or half clean, 128 horses by the ordinary process. If the steam-brush is passed over the horse at a moderate speed once, each square inch is actually brushed more than if an ordinary brush had been passed over it 400 times.

Asphalt used in the Preservation of Wood. — The increasing cost of wood in this country has led to a great number of experiments in preserving from decay all kinds of wooden structures exposed to the weather. Among the more recent plans suggested is one for impregnating wood with asphalt, combined with some antiseptic material. The finished wood, ready to be put together, is first submitted to heat to drive out the moisture, and is then placed in a hot bath composed chiefly of asphalt and carbolic acid. On cooling, the solvent of the asphalt evaporates, leaving a skin or coating of the asphalt on the surface of the wood that resists water and keeps the antiseptic material securely locked within the pores of the wood. The exterior of the wood presents a smooth, black surface that does not need to be painted.

A New Locomotive. — The compound locomotive recently invented by E. W. Webb, superintendent of the London and Northampton road, is attracting some attention in this country. Its purpose is to economize fuel by the use of both high and low steam. There are two sets of driving-wheels, which are not connected, but each set is driven by independent engines. The steam is first received, under high pressure, in two cylinders placed on each side of the boiler, and about half-way back. The pistons of these work the rear drivers by direct motion. The steam from them is then exhausted into pipes which are conducted in front of the boiler-flues to keep the steam hot, and then into one large cylinder located directly under the front of the boiler. This cylinder carries, by a shaft under the boiler, the forward drivers. A saving of over 25 per cent. upon the ordinary requirements is made in coal.

Coloring Glove-Leather. — The coloring of glove-leather has been usually performed by manual labor with brushes. This process, besides being slow, has the disadvantage that ugly edges are produced on the flesh side, and the coloring, in spite of great care, is never quite uniformly distributed. Herr Kristen, of Brünn, has sought to remedy this by a (patented) process, in which uniform coloring is effected with the aid of centrifugal force, the skin being fixed on a horizontal disc, the coloring poured on it at the middle, and the disc rotated. Thus an equal distribution of the matter is obtained. The liquid in excess flies over the edge, and is caught in a funnel, which guides it to a reservoir, whence a pump brings it again to the disc. In about ten to fifteen minutes a skin is finished. Only one man is required for five of the machines, which are placed near one another, and driven by the same shaft. In twelve hours 150 skins can easily be colored by this method, and in a very satisfactory way.

Alcohol from Potatoes. — The manufacture of alcohol from potatoes by means of hydrochloric acid is carried on entirely in Germany (according to *Le Génie Civil*), as follows: The potatoes are introduced into apparatus in which they are treated with steam at high pressure; then saccharification is effected with hydrochloric acid, and the excess of acid is neutralized with carbonate of soda. The cooled mass is submitted to fermentation in vats, then distilled. When saturation has been reached, the residues may, without inconvenience, be employed as food for cattle.

Silicated Chalk. — It is ascertained that chalk, whether in an artificial paste or in its natural state, if plunged into a solution of silicate of potash, absorbs even in the cold, a quantity of silica, which may be increased to a considerable extent by exposing the stone alternately, and for many times, to the action of the solution and of air. The chalk assumes a smooth appearance, a compact grain, and more or less of a yellowish color, according as it is more or less impregnated with iron. Stones thus prepared are susceptible of receiving a high polish. The hardness, which at first is but superficial, penetrates by degrees into the centre, even where the stones are of considerable thickness. They appear susceptible of undoubted utility in the more ready formation of works of sculpture and various ornaments, even those of the most delicate workmanship. Attempts have been made to apply these stones for lithography.

Painting Zinc. — A difficulty is often experienced in causing oil-colors to adhere to sheet zinc. Boettger recommends the employment of a mordant, so to speak, of the following composition: One part of chloride of copper, one of nitrate of copper, and one of sal ammoniac are to be dissolved in 64 parts of water, to which solution is to be added one part of commercial hydrochloric acid. The sheets of zinc are to be brushed over with this liquid, which gives them a deep black color. In the course of from 12 to 24 hours they become dry, and to their now dirty gray surface a coat of any oil-color will firmly adhere. Some sheets of zinc, prepared in this way, and afterwards painted, have been found to entirely withstand all the atmospheric changes of winter and summer.

Self-Luminous Paint. — Boil for an hour 2¼ ounces caustic lime, recently prepared by calcining clean white shells at a strong red heat, with 1 ounce of pure sulphur (floured) and a quart of soft water. Set aside in a covered vessel for a few days; then pour off the liquid, collect the clear orange-colored crystals which have deposited, and let them drain and dry on bibulous paper. Place the dried sulphide in a clean black-lead crucible provided with a cover. Heat for half an hour at a temperature just short of redness, then quickly for about 15 minutes at a white heat. Remove cover, and pack in clay until perfectly cold. The addition of a small quantity of pure calcium fluoride to the sulphide before heating it is made. It may be mixed with alcoholic copal varnish.

ELECTRIC SPARKS.

Electrical Matters Abroad. — It was announced that an exhibition of electricity was to be held at Vienna this year, and another at Munich. Considering the disadvantage of these being at the same time, the Vienna Committee have resolved to delay till August–October, 1883. In Bavaria, the railway authorities have offered the Exhibition Committee trains for trial of systems of lighting, and the telegraph authorities lines for trial of long-distance telephoning; the longest of the latter is from Munich to Dresden, 550 kilometers (343 miles). Telephonic experiments have been lately made with success, by day, on the line between Paris and Dijon, a distance of 314 kilometers (196 miles). It is curious to read that three telegraphic stations have been recently opened in Palestine, at Nazareth, Tiberias, and Safiè. In Arabia, the material is getting ready for construction of the system of telegraph-lines of Hedjaz. Part is destined for the first lines from Djedda to Mecca, and from Mecca to Yambo and to Medina; the rest for connection of the lines projected for Hedjaz with the existing lines in Yemen.

A Curious Electrical Phenomenon. — A remarkable instance of the development of electricity by friction has been brought to light in a Berlin brewery. The building is constructed of stone and iron, with the floors laid in asphaltum. In the upper story of the malt-house is a malt-cleaning machine, from which the cleaned malt is conducted, through an iron shoot, to wagons, for distribution through the works. If the malt-cleaning machine remains a long time in operation, — which frequently does occur without intermission for three weeks at a time, — electricity is developed by friction of the malt in the iron shoot, and in the most insulated portions of it. Such is the tension of the electricity that sparks continuously flash here and there, the malt crackles throughout, and sparks fly from it to the hands of the *employés*. The men at first thought this was a demoniacal exhibition, until an expert calmed their fears. This gentleman, Herr Nehrlich, brought the subject before the Electrotechnical Union, and the discussion thereupon elicited statements from several members, who had noticed similar appearances in other breweries, etc. Dr. Werner Siemens showed how, through the existence of the asphalt floors, the malt-room is so insulated from other portions of the building that it electrically resembles a Leyden jar.

Agriculture.

PRESERVATION OF LAWNS.

It is not as difficult to maintain lawns in prime condition in this country as in England; or rather the spread of wild and noxious plants in lawns in England is more rapid and persistent than in the Northern States of this country. The reason is, the constant moisture in England is favorable to the growth of mosses, plantains, daisies, etc., while our dry seasons keep them in check. The noxious weeds, most of them, have very strong roots, and the leaves lie very close to the ground; so when the grass is cut it is weakened by the loss of its leaves, but the weeds are uninjured, comparatively, and continue to thrive. The severe droughts here are not favorable to the continuance of the intense green of lawns noticed in England; our lawns are often dry and brown in July and August, indicating the need of moisture. But the lawns in England are not always green; we have seen Hyde Park when the grass, usually green and luxuriant, was burnt to a crisp, and this was the state of the beautiful lawns all over England.

The most troublesome weed we have to contend with is the dandelion. It is a plant which has a persistency of life and facility of propagation quite unusual, and in lawn culture is an enemy of no small magnitude. We endeavored, the present season, to exterminate the plant by continuous cutting and by digging up the roots; but it was found that while the men were cutting up the flowers in one place those uprooted an hour before would, in a mysterious manner, perfect their seed-bearing apparatus, and the winds would float the winged enemy to all parts of the field. The daisy and the dandelion are pretty flowers, but they are great nuisances upon lawns.

We have found that weeds are kept in check by the avoidance of the use of animal manures. During the past ten years, we have employed the nitrate of soda and alkaline salts for fertilizing purposes with most satisfactory results. As we have about four acres of lawn to maintain in condition, its preservation has been made a study.

Lawns should not be shaven too closely, and once a week is often enough to use the mower. On small plots, the fertilizer may be best applied in the liquid form; and if one is willing to bestow a little extra care upon a lawn it may be maintained in great beauty in the driest seasons.

A barrel of water, in which is dissolved two pounds of nitrate of soda, one pound of muriate of potash, and one pound of the genuine bone superphosphate, may be sprinkled over a lawn of four or five thousand square feet once in two weeks, during the summer, with great advantage. When the salts are applied in the undissolved state, they should be pulverized very fine, and mixed with three or four times their bulk of good sifted loam, and sown evenly. A few pounds of dry plaster (gypsum) may be added to the mixture, as it promotes the growth of the white clover. With a little attention lawns may be maintained in good condition for many consecutive years.

Mr. Charles G. Francklyn, in whose sea-shore cottage President Garfield died, has just founded and endowed a sanitarium for poor children, at Elberon, in memory of his young daughter, Gladys Francklyn, who died recently in Paris.

RED CLOVER.

Red clover is, upon the whole, a rather troublesome crop, as it is very coarse and difficult to cure, and it falls down when nearly mature, mildews, and often utterly decays before the mower can reach it with his scythe. Also, it so shades the ground that other forms of vegetation perish, and large patches of denuded soil are found on all clover fields. In England a troublesome disease attacks clover, called the "clover sickness," the nature of which has not yet been satisfactorily explained. In this country it has not been recognized so far as we know, but we think it would appear if our farmers were in the habit of repeating the growth of clover on the same field for successive years, as do the English farmers. The roots of clover are prodigious in size and extent, and it seems to us clear that the roots require several years to decay in the soil; and therefore to repeat the crop brings on a kind of vegetable fermentation in the soil which is fatal to plant life. Clover roots accumulate and hold large quantities of mineral matter and nitrogen, and they run very deep in the soil.

It may be that the true use of clover is to aid the farmer in keeping up the fertility of his lands. It seems to be specifically adapted to this end. We certainly have no plant like it. It is peculiar in its capabilities of enriching soils, if cultivated with this end in view. We do not think it well for farmers to grow clover for forage to any great extent, but if a run-down farm is put into red clover, and the crops ploughed under in the green condition, rapid improvement follows. As an accumulator of nitrogen, clover is indeed peculiar, and its cultivation probably furnishes this important element in soils at cheaper rates than from any other source.

DR. J. B. LAWES ON ENSILAGE.

Dr. Lawes does not advocate the construction of silos in England, or the use of ensilaged crops. There are many processes in farming in the United States which would be inadmissible in England, and, on the other hand, methods of English husbandry are not, in all cases, suited to our country, but the great facts in chemistry, as applied to agriculture, hold good the world over. Dr. Lawes writes to the London *Agricultural Gazette* regarding ensilage as follows: —

With regard to ensilage as practised in the United States, it is almost entirely confined to Indian corn. The crop is cut down as it comes into flower; it is then cut into chaff, and thrown into large pits, which are covered over. When these pits are opened there is a strong smell of acetic acid and alcohol, and — as far as I can gather from the published experiments — there is a loss of something like 40 per cent. of the organic part of the crop.

Maize is so full of saccharine matter, at one period of its growth, that it has even been proposed to use it for making sugar; it is evident that the sugar contained in the crop placed in the silo has been destroyed by its conversion into alcohol, and acetic and carbonic acids.

In my remarks on the subject I did not in any way find fault with the process as applicable to the agriculture of the United States; but I did say that in Great Britain, when we had produced sugar in our crops, we could not afford to have it destroyed by fermentation.

An enthusiastic advocate of ensilage in the States points out, as one of its great advantages, the enormous increase in the percentage of the mineral matter of the maize after it has been in the silo some months; this increase, however, could only be in proportion to the amount of destruction which had taken place in the organic matter of the plant.

A WORD ABOUT SILOS.

So far as silos constructed and used last season have come under our observation, they have not withstood well the combined action of acetic acid and water and moisture. This relates to silos constructed of stone under ground, and plastered with hydraulic cement. The cement, under the combined action of the acid and external water, will crumble and fall off, leaving wide areas of the walls in a denuded condition.

In all silos acetic acid is developed to a greater or less extent, and this, in the form of vapor, comes in contact with the lime in the cement, and forms a fixed salt, an acetate. When this occurs the wall is weakened, and falls as soon as the contents of the silo are removed. It should be known that cemented walls are not impervious to the *inflow* of water. Although cisterns will hold water, if left empty in wet places, water will find its way through from without; and numerous silos constructed on the sides of hills where there are springs were found to have several feet of water in them last spring. Considerable loss resulted from this cause. All silos should be constructed with drains, and it is very important that the drains should be trapped, so as to prevent a current of air from passing in under the contents of the silo.

As a rule, where silos are constructed under ground, it will be better to plank them inside of a rough, dry wall. The planks will last many years and need but few repairs.

If ensilage is to hold its place in popular estimation, much is to be learned in regard to the construction of pits and in methods of ensilaging. There is little doubt but that the cutting process which is so expensive and laborious may be dispensed with, and it will be found that it is better to partially dry the fodder in the field before putting it into the pits. If twenty-five per cent. of the water is removed, it will cost much less to handle the fodder, and the value will not be in the least diminished.

ANALYSIS OF EEL-GRASS.

The following, from the New Bedford *Republican Standard*, will be of interest to our farmer friends on the sea-shore: —

At a meeting for discussion of the South Bristol Farmers' Club last winter, in considering the value of eel-grass as a fertilizer, wide difference of opinion prevailed. Some thought its worth consisted wholly in its use for bedding stock, and as an absorbent of liquids, while others claimed that it contained large fertilizing properties. It was finally decided that specimens should be sent to Professor Goessman, of the Massachusetts Agricultural College, for analysis. The samples were taken from Sconticut Neck, and were apparently free from sea-shells or organic matter. One sample was fresh from the water, and the other had been lying upon the uplands on the heap during the winter. On the 2d of May the club received the following response: —

Amherst, Mass., *May* 2, 1882.

Please find enclosed the results of careful analyses of two samples of eel-grass, sent for that purpose

March 18, 1882. Sample No. 1 refers to the fresh eel-grass in an air-dried state, and No. 2 to a sample exposed for five months to air, sun, and rain. I remain respectfully yours, C. A. GOESSMAN.

Analysis.

Fresh eel-grass No. 1, air-dried, moisture lost at 100 deg. C.	18.98 per cent.
Organic and volatile matter	79.61 " "
Ash constituents	20.39 " "
Potassium oxide	1.61 " "
Phosphoric acid	0.41 " "
Nitrogen	0.70 " "
Calcium oxide	1.56 " "

He writes that in the fresh and wet state there are about 45 per cent. more of moisture present, which they probably dried out in the air.

Eel-grass No. 2, five months old, moisture lost at 100 deg. C.	25.17 per cent.
Organic and volatile matter	89.18 " "
Ash constituents	10.81 " "
Potassium oxide	0.21 " "
Phosphoric acid	0.22 " "
Nitrogen	0.96 " "
Calcium oxide	2.70 " "

Some of the points in the analysis not appearing plain to those unacquainted with chemistry, the writer requested of Professor Goessman a note of explanation on some of the facts brought out in the analysis, to which the following reply was received from him: —

" The composition of the sea-weeds in their natural condition is somewhat modified by adhesive sea-shells, sea-water, etc.; not two samples would strictly agree in composition. Time and exposure modify organic and inorganic constituents; the alkalies and some phosphates are washed out in part by rain, etc.; starchy materials are decomposed apparently at a higher rate than nitrogenous organic matter; lime and magnesia compounds increase in rate by keeping in open air; potash and soda decrease. The entire amount of potash, phosphoric acid, and nitrogen contained in organic vegetable matter is available in the same ratio as the disintegration advances. Potash per pound, five cents; phosphoric acid per pound, six cents; and nitrogen per pound, twenty-two cents, is, at present market condition, a fair valuation."

This analysis shows a high commercial value of eel-grass, which some have heretofore claimed for it. As the professor says: " The chemicals in eel-grass are available in the same ratio as the disintegration advances; and as eel-grass decays very slowly, under most circumstances, its agricultural value in general is not so fully appreciated as in those materials of equal commercial value which decay rapidly." It appears from the analysis that eel-grass, which some have placed so low an estimate on, is really of considerable value.

SOOT AS A FERTILIZER.

A WRITER in the London *Garden* gives the following facts and hints under this head: —

There can be no doubt that soot is an excellent fertilizer, and it is possibly less appreciated as such than it deserves to be. I recollect trying experiments with various kinds of manure, including soot, with the view of ascertaining their effect upon the production of various culinary crops, such as peas, potatoes, French beans, cauliflowers, etc., and, so far as I can remember, the crops obtained from the portion of land dressed with soot were next in point of produce, or nearly equal, to those obtained from land heavily dressed with well-decomposed stable-yard manure. At all events, the two fertilizers just named proved much better than all the others tried, consisting of bone dust, nitrate of soda, gas lime, wood, coal, and other ashes, spent hops, etc. Soot should therefore be secured whenever it is possible, and as it is of great importance that it should be kept dry a bin or large box of some kind should be placed under cover for its reception. It may with benefit be applied to all kinds of land, light as well as heavy, and there is hardly a crop cultivated in the garden to which it may not with great advantage be occasionally applied.

Soot water is found to be exceedingly beneficial to the grape-vine, when applied in the form of a dressing to the surface of the border, whether inside or outside. The soot is gradually conveyed to the feeding roots by the action of rain or the repeated applications of water, and the texture and color of the foliage soon show the good results derived therefrom. Strawberry plants in pots may also be greatly benefited by repeated applications of soot water, which has the effect of driving earthworms, maggots, etc., from the pots as well as acting as a fertilizer. Indeed, there are few, if any, plants grown in pots which may not be more or less benefited by its occasional application, and I have never known plants to be injured by it, although I have known it to be applied even to Cape Heaths and Epacrises, and it is known to be a valuable stimulant in the case of the camellia.

It is also admitted to be a powerful manure for most kinds of culinary crops; in the case of the onion it is of the greatest value. This crop is frequently attacked by the maggot, which, if not checked, soon commits sad ravages, and the best remedy is a good dressing of soot. As, however, prevention is better than cure, the land intended for this crop should, in almost all cases, have a good dressing of this material shortly before the seed is sown, in addition to any other manure which may have been given during the preceding winter. Nearly all plants of the Brassica tribe are liable to be attacked by what is known as the club, which frequently proves very troublesome, and the best known preventive of this is what is called puddling the roots of the plants, — an operation easily performed by merely making a hole in the soil near to where the plantation is intended to stand; in this hole place a portion of fresh soot, and to this add a portion of fine soil and water, until it acquires the consistency of thick paint, and into this dip the roots of the plants before planting them. Seed-beds of the various kinds of cabbages, lettuces, radishes, etc., when the seed is just about to germinate, are very apt to be attacked by birds of various kinds, and this may sometimes be prevented by giving the surface of the beds an occasional slight dressing of fresh soot, the odor of which the feathered depredators do not by any means relish. A slight dusting of this material round newly planted lettuces and other plants will also go far to keep slugs and snails from attacking them, which they are apt to do, before the plants have recovered from the effects of transplantation. Grass lawns and belts in the pleasure grounds, etc., may also be frequently much improved by the application of soot, or a mixture of soot, wood ashes, and fine soil; this appears to have the effect of encouraging the growth of the finer sorts of grasses, and as it were assists them to overcome and to finally extirpate the coarser kinds, together with weeds and moss.

GLEANINGS.

HOW TO KILL DOMESTIC ANIMALS HUMANELY. — The August number of *Our Dumb Animals* contains full directions, illustrated by cuts, "how to kill domestic animals humanely." To supply the public, the society has printed five thousand extra copies. Each person owning a domestic animal can obtain a copy without charge by calling or sending to the Society's office, 96 Tremont Street.

A BON MOT OF ARAGO'S. — " What are comets made of? " asked a French lady of the distinguished savant. " Madame, I do not know." " Then what is the use of being an Academician? " " Madame, that I may be able to say I do not know."

Boston Journal of Chemistry.

JAS. R. NICHOLS, M. D., *Editor.*
WM. J. ROLFE, A. M., *Associate Editor.*

BOSTON, SEPTEMBER 1, 1882.

A CITY OF WATER JUGS.

THE various roads leading from the country to this city present a curious spectacle in the early morning, the ways being encumbered with numerous vehicles heavily laden with casks and jugs of different sizes, filled with fresh water from the numerous springs in adjoining towns. These jugs are distributed to stores, counting-rooms, and houses in all parts of the city, and the water is used for drinking and culinary purposes in place of the Cochituate water, which is supplied to almost every inhabitant. The empty jugs are picked up by the enterprising water carriers, and returned again filled with the sweet water of the country springs.

The cost of this supply of water is large to individuals, and very large in the aggregate, and the luxury can be indulged in only by those of ample or fair means.

The cause of this amusing display of water jugs in the streets, counting-rooms, banks, restaurants, dwellings, etc., is that an impression prevails that the water supply of the city is not suited to domestic uses by reason of impurities. There has been noticed for many months a disagreeable odor and taste in the water, and protracted discussion has occurred as to the cause of this offensiveness. The resources of science have been exhausted in efforts to discover the cause, but without any satisfactory results. Professor Remsen had the good luck to hit upon a plausible theory, which attributes the difficulty to the growth and decay of fresh-water sponges in the ponds or supply basins; but as these sponges exist in considerable quantities in numerous ponds in New England where the water is perfectly tasteless and unobjectionable, the theory has no good grounds to rest upon.

These sponges are found in six or eight ponds in Essex County, where the conditions are precisely similar to those of the Framingham pond, and no unpleasant results to the water are observable. If the Remsen theory were satisfactory to the water takers, and would have the effect to quiet apprehensions, the labor would not have been lost; but such is not the case.

In one view the condition of the city water supply is greatly exaggerated, and that relates to its possible unhealthfulness. We do not conclude, from the results of many years' observation upon the sanitary influence of New England pond waters, that there is anything contained in Boston water at present which is positively deleterious to health. These country water basins are to a large extent similar in their surroundings, and they swarm with the lower forms of animal life, and large quantities of fish of various kinds are present; but they have no positive anti-sanitary influence. They may confer disagreeable physical qualities, but not chemical.

Boston water contains no impurities which may not be removed easily and readily by mechanical means. The inflowing of water jugs may meet the ends of a conceit, and so far as it is confined to wealthy citizens the conceit is ap-

parently harmless; but poor people cannot afford to purchase water in jugs, and they are excited to alarm by the acts of those who can afford it. The jugs create uneasiness and apprehensions on the part of the mass of the people of the city, without doubt.

By filtration, even by the most simple means, Boston water becomes pure and inodorous, and as good for domestic uses as any brought from springs. The use of ordinary flannel, of several layers, securely attached to a water faucet in the form of a small bag, gives to the inflowing water a colorless appearance, and removes nearly all offending matters. It is better, however, to use a filter of more efficient nature, and this can be of home construction and cheaply made. A cylinder of tin, three inches in diameter and six or eight inches long, filled with alternate layers of clean beach sand and pounded charcoal, answers an admirable purpose. It may be attached to the faucet by a screw obtained from the plumbers, and there should be a delivery tube at the bottom. It is best to have two delivery faucets: one for filtered water, for strictly culinary and drinking uses; and another for supplies for sink purposes and for washing. A filter used only for water for culinary purposes will serve its end in most families for several months, and when it fails of satisfactory service it may be removed, the contents changed, and again put in its place.

If some plumber in the city would construct cheap and convenient filters, costing no more than a couple of dollars, on the plan suggested, he would confer a great service upon the poor people of the city and reap a rich pecuniary reward.

THE AURORA.

Displays of the aurora have been frequent during the past month, and the one on the evening of August 4th was of extraordinary brilliancy and beauty. Those of our readers who had the privilege of seeing the waving and flashing lights reflected in the sea, as at Martha's Vineyard and Cape Cod, will not soon forget the novel and fascinating spectacle.

Some of our readers may not be aware that the present season is one during which these exhibitions of celestial fireworks are likely to be often repeated. The aurora has three distinct periods; the shortest being a half year, and the time of greatest frequency the equinoxes, of least frequency the solstices. The second period is of about eleven years, corresponding with that of the sun-spots. Auroras are most frequent at the time of most sun-spots, least so at the time of least sun-spots. The year 1882 is a year of most sun-spots, and hence it is a year of many auroras. The same thing happened in 1870. In 1877 occurred a period of least sun-spots and fewest auroras, and the same thing will happen in 1888. The third period is a cycle of five or six of the eleven-year periods; that is, every fifth or sixth period has more auroras than the intervening ones. Such periods occurred in 1728, 1780, and 1842.

The occurrence of an aurora corresponds with a period of electric and magnetic disturbance. During an aurora the telegraphic currents are disturbed and magnetic needles restless. During the brilliant display on the night of April 16th of this year, telegraphic communication between New York and Chicago was interrupted, and the Chicago morning papers had to go without their usual Eastern telegrams. They filled their space, however, with accounts of the aurora, which was worth much more to their readers. It was one of the finest displays ever seen in the United States.

PUBLIC SCHOOL LIFE IN AMERICA.

The *Boston Medical and Surgical Journal* publishes a paper on "The Diseases and Dangers Incident to School Life," which was read by Dr. G. S. Stebbins, of Springfield, before the District Medical Society, in April last. The writer concludes with a suggestion that ventilation and sanitation should always be looked after by some one having sufficient knowledge to enable him to secure them, and determination to maintain them. There should therefore, he thinks, be a medical inspector of schools appointed, whose duty should be to thoroughly examine every school-house as often as once a month, for the purpose of obtaining exact information regarding their ventilation and general sanitary condition, and such officer should have the requisite authority to order every nuisance to be abated at once, and to enforce all needed sanitary regulations. To such an officer all cases of outbreak of contagious and infectious diseases, as scarlet fever, measles, diphtheria, etc., might be referred, so that he could at once institute measures to prevent their spread. A rigid quarantine of all pupils affected with contagious diseases is, the paper observes, of the utmost importance. Further, to this officer all parents should be referred, who seek for any modification of the rules of discipline in favor of their children on account of bodily weakness or mental infirmity, so that he might investigate such cases and report accordingly. Such an office as this, filled by a man clothed with the needful authority and power, and who would thoroughly, conscientiously, and fearlessly discharge his duty, would, the writer thought, be of vastly more importance than that of janitor, school-house agent, not to say superintendent of schools.

FOREST TREES IN THE WABASH VALLEY.

In an interesting paper published in the "Proceedings of the National Museum," Mr. Robert Ridgway gives the results of long and careful observations made by himself and other naturalists upon the forest growth of Southern Indiana and Illinois. This region is of special interest, because here many of the peculiarly Southern trees, like the pecan, the water locust, the overcup oak, and the bald cypress, reach their Northern limits, and because this forest is hardly surpassed by any other in the number of species of which it is composed, and the magnificent development attained by many individuals. Nowhere in the whole of Eastern America have as many large specimens of as many species been recorded as Mr. Ridgway finds in the Lower Wabash Valley. Nearly all of our largest and most valuable broad-leaved trees are here found associated together; and in a single square mile of woods seventy-five species of trees, nearly all of the first class, were detected by him, or nearly as many as grow on the whole European continent. By actual measurement, thirty-four species are found to occasionally exceed 100 feet in height, while seventeen others, although not measured, are believed to attain a height of at least 100 feet. The tallest specimen measured, a tulip-tree, was 190 feet in height, and individuals of ten other species exceed 150 feet.

Mr. Ridgway calls attention to the fact that the numerous small prairies which were common in the Wabash Basin at the time of its first settlement have become transformed into woodland, and that, owing to this gradual change of prairie to forest, the actual area of forest in Wabash and the adjoining counties in Illinois is greater than fifty years ago. Extensive woods of oak and hickory more than eighty feet high, and with trunks nearly two feet through, are now growing on what was open prairie within the memory of some of the present owners of the land. "This is interesting as a slight indication of the solution of the mystery which involves the origin of the prairies; while the rapidity with which these new woods have sprung up shows that the reproduction of our failing forests can be accomplished in a shorter time than is generally supposed, if proper consideration and attention can only be given to the subject."

METEOROLOGY FOR JULY, 1882.

The sum of my observations on the weather for the past month has been as follows: —

Average Thermometer.		Lowest.	Highest.	Range.
At 7 A. M.	67.03°	56°	76°	20°
At 2 P. M.	79.26°	60°	90°	30°
At 9 P. M.	69.98°	57°	79°	22°
Whole month	71.92°	56°	90°	34°
Second average[1]	71.81°			
Last 19 Julys	70.77°	65.64° in 1867	74.36° in 1876.	8.72°
Second average[1]	69.66°	64.43°	73.34°	8.91°

[1] Found by adding the average evenings *twice*.

The average barometer for the month was 20.957 inches; the lowest, 29.64, on the 1st, and the highest, 30.22, on the 31st, a range of .58 of an inch. The average for the last 10 Julys is 29.919; the lowest, 29.891, in 1881, and the highest, 29.957, in 1882, a range of .066 of an inch. The sum of the daily variations was 2.84 inches, an average daily movement of .092 of an inch. The average for the last 10 Julys is .089, with extremes of .061 and .118 in 1873 and 1879. The rainfall in July of those years was 2.88 and 3.37 inches.

The face of the sky in 93 observations gave 63 fair, 15 cloudy, 10 overcast, and 5 rainy. The amount of rainfall was 3.20 inches. The average for the past 14 Julys has been 3.19 inches; the lowest amount, 1.43, in 1874, and the highest, 6.85, in 1876.

The direction of the wind in the usual observations gave an excess of 49 southerly and 53 westerly over the northerly and easterly, indicating approximately the average or prevailing direction of the month to be west 42° 45′ south, or nearly S. W. The average direction for the past 14 Julys has been west 27° 50′ south. The westerly winds have uniformly prevailed, varying from 11 to 56 observations in excess of the easterly, while the southerly have prevailed over the northerly every year, with but a single exception, that of 1880, when the northerly excess was 4. The average westerly excess has been 38.1, and the southerly 20.1.

The first week in July was unusually cool for the season, giving an average of only 62.92°. But the closing week was unusually hot, especially the six days from the 23d to the 28th, inclusive, giving an average of 76.38°, and bringing the entire average of the month 1.15° above the average for the

past 19 years. The same six days in Boston, as reported in the *Daily Advertiser*, gave an average of 77.8°, or 1.42° warmer than at Natick. The difference was still greater during the middle of the day, giving an average of 87.5° at 11.23 A. M., and 88.17° at 3.23 P. M., while it was only 84° at 2 P. M. at Natick, — a difference of nearly 4°.

The 25th, 26th, and 27th were the warmest days of the month, in nearly equal degree; an average in Boston of 81°, 82°, a d 79.3°, and at Natick of 79.66°, 80°, and 80°, while the highest point reached there at the hours of observation was 94°, and here 90°. In the sun here it reached 119°. Such extreme heat, day after day, parched vegetation exceedingly, cutting short the pasturage, but was favorable for the growth of the backward corn and for harvesting hay and grain.

On the 28th the morning was smoothly overcast, the wind N. and somewhat cooler, but at 8.30 several claps of thunder were heard, without any lightning being observed, or signs of a shower, and in about 30 minutes .4 of an inch of rain fell, followed by a change of the wind to the S. W. and a peculiar steamy heat that was very oppressive. The long-heated earth seemed to breathe back in part the sudden dash of rain into the atmosphere. The thermometer rose to 87° at 2 P. M., with an average through the day of 76°, or six and a half degrees above that in Boston the same day, — a remarkable fact, if correctly reported. In the afternoon the clouds again gathered, and, meeting from different quarters, caused a severe tempest, with sharp lightning, doing considerable damage in many places, accompanied with heavy thunder and a brisk wind. The rain fell in torrents, mingled with hail for two or three minutes, and in less than one hour there was a rainfall of 1.3 inches, most of it falling in 25 minutes, or less. The wind changed to nearly every point of the compass, but finally settled again into the S. W., a quarter from which the wind blew a large part of the month, giving 44 observations out of 93. We had rain, in nearly equal amount, on the 1st, 5th, 13th, and 19th, in all these 1.5 inches, and on the 28th 1.7; but coming so rapidly, much of this ran off the surface, without accomplishing the usual benefit. The season is perhaps still somewhat behind the average, but the late very warm weather is fast restoring the equilibrium.

D. W.

NATICK, *August* 5, 1882.

EDITORIAL NOTES.

AN APPARENT CASE OF PLAGIARISM. — Dr. R. H. Ward, one of the editors of the *American Naturalist*, informs us that the extract in our last number on "The Microscope in the Detection of Forgery," credited to Mr. John Rogers (taken by us from an English exchange), is an abstract of his remarks on the same subject in the President's Address on Practical Uses of the Microscope before the American Society of Microscopy, August 19, 1879. The lecture was printed in full the next morning in the local (Buffalo) papers, and distributed in England as well as this country. It was afterward published in a permanent form, and the marked copy sent us by Dr. Ward shows that the paragraphs quoted are not only a close and intentional abstract of his address, but that they are given largely in the same words and phrases. Dr. Ward's statements were based on more than twenty years of experience and original working in a field which was then new and practically unoccupied; and his address, so far as we can learn, was the first effort, certainly the first successful one, to direct the attention of the scientific world to this branch of work and to make it generally useful. If Mr. Rogers had given Dr. Ward any credit, we think we could not have overlooked it. We cannot now find the journal from which we copied the extract, but if we do Mr. Rogers any injustice we shall be grateful to any friend who will point it out to us.

DIGITATED STOCKINGS. — We are inclined to think, says the London *Lancet*, that digitated stockings — that is, stockings with a stall for each toe — would conduce much to comfort, and spare many persons who now suffer from the development of soft corns between the toes a serious trouble. They would also prove more cleanly than the stockings in common use, because they would naturally absorb and remove the acrid moisture which accumulates between the toes, and which is the general cause of offensive odors from the feet. They will, moreover, give the foot better play, allowing its phalanges greater freedom of action. And, lastly, a well-fitted digitated sock or stocking will remove a mass of material from the toe of the boot, and at the same time give increased breadth and space for expansion across the base of the toes. The new stockings, supposing them to be well cut and fitted, possess many advantages.

MERCILESS LETTERS. — Mr. Ruskin asks his friends to refrain from troubling him with unnecessary letters. There are a good many other distinguished veterans who will echo for themselves the wish he expresses. He says: "I venture to hint to friends who may at any time be anxious about me that the only trustworthy evidences of my health are my writings, and that it is a prettier attention to an old man to read what he wishes to say, and can say without effort, than to require him to answer vexing questions on general subjects, or to add to his day's appointed labor the burden of accidental and unnecessary correspondence."

FRIENDLY ROBINS. — The *Christian Register* says: Friendly acts of birds of different species to one another have been rarely witnessed. Such an instance has just been related by Mr. R. B. Forbes, of Milton. "My mocking-bird," he says, "hangs under the piazza, and near him is a robin's nest containing young birds. The parent birds seem to be busy all day bringing worms to their young family. Twice the robins have been seen to alight on the cage of the prisoner, and drop worms into his mouth, passing by their own well-fed young. Were Longfellow here, I should invoke his aid in commemorating this fact in rhyme."

A NEW JAPANESE TEMPLE. — Near Kioto, in Japan, was burned last spring a temple which had stood nearly seven hundred years. It was erected by a priest named Meikei, who first introduced tea into Japan. Tea merchants of Kioto and Osaka have resolved to rebuild it in his honor. In parts of Japan where the culture of tea is now most prosperous, the plants were first brought there by Meikei.

ATOMS.

IT is stated that a single firm in Philadelphia last year manufactured and sold over 100 tons of Paris green for the destruction of the potato-beetle and cotton-worm.

SOME experiments have been made by M. Decaux, on the effect of the electric light on the colors of cloths and paintings, etc. The colors were exposed for 1500 hours, under thin glasses to the action of an arc light at a distance of 150 cm. (about 60 inches), and under these conditions the effect of the electric light was found to be similar to that of sunlight, but only one fourth as great.

AN English mechanic bas invented a horseshoe composed of three thicknesses of cowhide compressed into a steel mould and subjected to a chemical preparation. It will last longer than the common shoe, weighs only one fourth as much, does not split the hoofs, requires no calks, and is very elastic.

IMMENSE MIRRORS. — There have been set up in the Grand Opera House at Paris a number of mirrors, measuring 45 by 52 feet, and weighing from 1200 to 1600 pounds.

TAN-BARK, ground, compressed, and put up in half-barrel packages, promises to become an important American export to Europe.

MR. JAMES S. HORTON, of Rehoboth, well known as a successful farmer and an owner of premium stock, has a very fine pair of twin oxen, seven years old, that weigh 4300 pounds.

A CORRESPONDENT at the West suggests that the explosion of dynamite in the track of the cyclones that so often devastate that region might check them, just as a cannon-ball breaks up waterspouts at sea. He mentions incidentally that the forward motion of the Des Moines cyclone was only twelve miles an hour, though the circular motion was a hundred miles in the same time.

DURING the intense heated term the last of July, the rays of the sun were so powerful as to explode and set on fire an iron can of bisulphide of carbon, which was being carted through the streets of Boston. The dray was set on fire, and the services of the fire department were required to quench the flames.

THE *Moniteur de la Flotte* describes a proposal for placing passing ships in communication with existing submarine cables. The projector would float buoys with the necessary connecting wires and apparatus at intervals of a day's journey along the line of the cable, each numbered and properly lighted at night and he considers that the plan presents but few difficulties, and would obviate much anxiety and many dangers.

THE Channel Tunnel works at Dover are being continued, it is stated, with very satisfactory results. The total length of the heading is now stated to be considerably above 2000 yards.

CANES and umbrellas with an ear-trumpet ingeniously fixed in the handles are now sold in New York at $25 each.

AT the Milan Exhibition a "vino solido" was introduced. It was in the form of a paste, which, when dissolved in a glass of water, was said to yield instantly a generous wine, of good appearance and bouquet.

THE Proprietary Article Dealers' Association, of the United States, estimate that their trade have spent $100,000,000 in advertising, the last twenty years.

NEW experiments have been made by M. Richet with a view to ascertaining the *minimum fatal dose* of the principal alkaline chlorides (of lithium, sodium, potassium, rubidium, and cæsium) on animals. The animals selected were small guinea pigs, and the substances were injected under the skin. M. Richet finds no relation between the atomic weight of the alkali metals and their physiological activity.

LITERARY NOTES.

The Treatment of Common Accidents and Diseases, by Dawson W. Turner, D. C. L., of Liverpool, England, is a most convenient and valuable little book, giving complete and, what is of greater importance, clear and common-sense directions for the treatment of common accidents and diseases, when no physician is at hand. It is especially adapted for the use of captains of vessels which carry no surgeon. Price 50 cents. For sale by A. Williams & Co.

House Drainage and Sanitary Plumbing, by Wm. P. Gerhard, of Newport, is reprinted from the fourth annual report of the Rhode Island State Board of Health, and gives a very full account of the various modern arrangements for drainage and plumbing, with a great deal of information regarding them, which will be of interest to every owner of buildings.

J. B. Lippincott & Co. have published an interesting little volume by Otis P. Manson, M. D., on *Sulphate of Quinine*. It comprises a full history of the drug, with very complete experiments on its therapeutical qualities, and physicians will find it of great interest. Received by Estes & Lauriat.

We have received from Geo. P. Rowell & Co., Advertising Agents, New York, the *American Newspaper Directory for* 1882, containing a full list of all periodicals published in the country, together with their circulation, and other information regarding them.

Medicine and Pharmacy.

LEAD POISONING.

Dr. E. S. Wood, Professor of Chemistry in the Harvard Medical College, contributes a long and careful article to the *Sanitary Engineer* on this subject. The causes which give rise to the greatest number of cases of chronic lead poisoning, as he states, are the use of lead carbonate in painting — and of these the majority occur in manufacturing the pigment — and the use of lead or lead-containing pipes for the conduction of drinking-water. After suggesting precautions to be observed by workmen in white lead factories, he goes on to speak of water pipes as follows: —

The use of lead pipe for conducting drinking-water is very extended, and yet comparatively few cases of poisoning result from it. This is due chiefly to the fact that certain hard waters cause a deposit of an insoluble coating, consisting of lead sulphate and carbonate, upon the inner surface of a pipe, which prevents any further action of water upon it, and that the people generally have learned the necessity of thoroughly emptying the pipe of the water which had stood in it for several hours. All waters do not act upon lead pipe with equal readiness. As a rule, the purer the water, the more readily does it attack metallic lead. Therefore soft waters take up the most lead and hard waters the least. Hard waters, however, vary in this respect. If a hard water contains only lime and magnesian sulphates and carbonates, without any alkaline sulphates or carbonates, it has no action upon the pipe except to deposit the insoluble coating upon its inner surface; if, however, alkaline salts are also present, the alkaline carbonate takes up a little of the lead salt, however hard the water may be.

Lead cisterns should never be used for containing drinking-water, nor, as a rule, should lead pipe be allowed to project beneath the surface of the water in a well, although in the case of most hard waters no serious consequences would result. It is better to use pure block-tin pipe beneath the surface of the water, soldering it on to the lead pipe above the highest level of the water in the well. Then only the small amount of water which is contained within the pipe has an opportunity to attack the lead, and if the pipe is thoroughly emptied of the water which has stood in it for several hours no serious consequences will result. Tin-lined lead pipe and tinned lead pipe are, in my opinion, more dangerous than pure lead pipe, since the galvanic action set up by contact of the two metals increases very much the action of the water on the lead.

How numerous are the other possible sources of lead poisoning may be seen from this further extract from Dr. Wood's valuable paper, and the enumeration should serve to put the reader on his guard against such of these as are liable to occur in his own experience: —

Any employment in which metallic lead or any compound of lead is used is liable to cause chronic lead poisoning. Among the more common employments may be mentioned working in lead mines, or any mines in which plumbiferous ore is handled; working with metallic lead, as in the case of plumbers and type-setters; the handling of lead compounds, as in the case of glazers of porcelain and pottery ware, manufacturers of enamel, etc.; the use of lead chromate (chrome yellow) and red lead (minium) as pigments; the use of lead or any of its compounds in any cooking utensil, or article used for preserving food, especially acid fruits and vegetables, which are often put up in soldered tin cans. The acid contained in some of these — as tomatoes — may easily remove a dangerous amount of lead from the solder, if eaten frequently during a considerable period. The use of lead-containing enamel for lining iron-ware to be used for cooking is very dangerous. I have personally known of several cases of acute and sub-acute lead poisoning resulting from cooking tomatoes in such enamelled iron-ware, and one fatal case in an infant, due to drinking milk which had been warmed in one of these vessels. This particular vessel is in my possession, and yields to water, to which a few drops of acetic acid have been added, when allowed to stand a few hours at the ordinary temperature, an amount of lead which might produce symptoms of poisoning in an adult. The addition of lead compounds to articles of food or drink — thus many yellow candies are colored with lead chromate, and many olive-green ones with a mixture of lead chromate and Prussian blue. Snuff has been known to be colored with lead chromate and with red lead. A not uncommon source of chronic lead poisoning is the cleaning of glass bottles with shot; the greatest danger arises in the case of champagne bottles, one or more shot sticking in the angle between the side and bottom of the bottle, owing to the carelessness of the bottle-washer. The carbonic or other acid of the wine, malt liquor, or cider readily removes a dangerous amount of lead from the shot. I have in mind a recent case of lead colic due to drinking bottled ale, the lead being derived from shot left in the bottles. Wine is sometimes sweetened by treating it with oxide of lead (litharge) or sugar of lead. The use of lead pigments for coloring children's playthings is very dangerous, the child being liable to put the toy in its mouth and suck off some of the poison. The use of spurious (lead-containing) tin foil is another source of chronic lead poisoning; some of this foil consists chiefly of lead (one specimen examined contained about 98 per cent. of lead), and is used for wrapping tobacco, pressed meat, and other substances. There is one case of poisoning recorded of a clergyman who was in the habit of using *cachous* for a sore throat, between one and two boxes being consumed daily: finally, after diligent search for the cause of the poisoning, it was found that several milligrams of lead were contained in the foil surrounding the *cachous* in a single box. The habitual use of some hair-dyes is also a frequent source of lead poisoning, many of these compounds consisting of sulphur, sugar of lead, and some fluid, as glycerine, water, etc. Some cosmetics also contain a lead compound.

GOLD AS A MATERIAL FOR FILLING TEETH.

It is a popular notion that gold is the best known material for filling carious teeth; but it appears that doctors disagree on this point, as on so many others. Dr. Henry S. Chase, of St. Louis, in a recent number of the *Philadelphia Medical and Surgical Reporter*, gives the following facts concerning this "dental heresy," as he says it is called: —

About eight years ago Dr. Fletcher, of England, announced in the dental journals that nine out of every ten gold fillings leaked. That is, the gold plug did not exclude saliva from the cavity of decay in which it was placed to do such duty. An "experimental dental club" in this country demonstrated the truth of the assertion, much to the disgust of its members.

About this time Dr. Palmer, of Syracuse, N. Y., asserted, in the *Dental Cosmos* of Philadelphia, that the failure of operations with gold lay mainly in its incompatibility with dentos (tooth-bone), forming with the latter a galvanic battery of low power, but of constant operation, of which gold was the negative element of the battery, and dentos the positive. As is well known, it is the positive element that suffers chemical disintegration in the battery.

The entrance of saliva under and around a gold plug in a tooth gives the condition of a constant battery, and, consequently, a constant decay of the tooth at that point.

Dr. Chase himself, Professor Flagg, of Philadelphia, and other experts have made careful investigations with a view to settling this question, and they fully agree with Drs. Fletcher and Palmer that gold is an inferior material for filling teeth. Of proposed substitutes Dr. Chase remarks: —

During the eight years that this subject has been under discussion, the thought of the profession has been turned toward the discovery of materials that would be in more electrical harmony with tooth-bone than gold is, and also make water-tight or saliva-tight fillings, and there has been great success in this line. Alloys of metals have been made which, being amalgamated, make not only water-tight plugs, but even those which will exclude alcohol as a test of completeness, and which have a tint more in harmony with the color of the enamel than gold has.

Besides metallic alloys, there are chemical combinations made at the instant of introduction into the cavity of decay, which are in comparative electrical harmony with dentos, and are, indeed, the positive element in the dental battery.

Other eminent dentists are not inclined to accept this "new departure" in their art, but we infer from the evidence collected by Dr. Chase that the "heresy" is rapidly spreading among the profession. We shall endeavor to keep our readers informed concerning its progress, or its losing ground, if that should be its luck, in the future.

THE "SALISBURY" TREATMENT OF PHTHISIS.

A correspondent asks for information concerning "the so-called 'Salisbury' treatment of consumption," or phthisis. We have not seen the recently published pamphlet on the subject, but we find the following abstract of the practical portion of it in one of our exchanges: —

In the opinion of the author, consumption comes from continued unhealthy alimentation, and must be cured by removing the cause. "This cause," he says, "is fermenting food and the products of this fermentation;" and if the simple directions contained in the book "are faithfully followed out and persisted in, consumption in all its stages becomes a curable disease." Beginning at the first direction, half a pint of hot water is to be drunk an hour before each meal and on retiring, to wash out the stomach. Tea, coffee, or beef tea may be drunk at meals, and hot water or beef tea in the intervals, if desired. For food, broiled beefsteak, without fat or bone, broiled chicken or game, oysters, and fish, free from fat, are prescribed, with bread, toast, rice, cracked wheat or oatmeal, in the proportion of one part by bulk to from four to six parts of meat. Soups, vegetables, fruits, pies, cakes and sweets, pickles and preserves, fried edibles generally, and vinegar are prohibited. Meals are to be taken at regular intervals, and the patient should eat either alone or with others using the same diet; and after the appetite increases, as it soon does, luncheons of broiled beefsteak and tea, coffee, beef tea, or hot water are permitted between the regular breakfast, dinner, and supper. In the way of general regimen, two thorough baths with hot water and soap are to be taken every week, oiling the skin all over afterwards, and every night and morning the body is to be sponged with hot water, containing for the even

ıg bath a few teaspoonfuls of ammonia. Flannel is ɔ be worn next the skin, and the clothing frequently hanged and aired. This, with as much open-air xercise as can be borne without fatigue, or thorough ubbing and pounding of the body morning and vening for those too weak to take exercise, consti- ute the substance of the treatment; but simple tonics f oil of peppermint, orange peel, ginger, witch-ha- el, and other mild ingredients are to be administered efore each meal, with small doses of pepsine after- rards, and hæmorrhage is to be checked by inhaling he spray of a weak solution of persulphate of iron.

TOBACCO AND BLINDNESS.

At the annual commencement of the Hospital College of Medicine, of Louisville, Ky., Prof. Dudley S. Reynolds delivered an address to the graduating students, in which he took strong ground against the use of tobacco: —

It is a well-known fact that tobacco deranges the ligestion and poisons the nerve centres of a majority of the male members of the human family. A spe- cies of blindness, not complete, but partial blindness, sufficiently great in extent to destroy the reading of ordinary type, results from the continued and exces- sive use of tobacco. Careful investigations have led to the discovery that that form of tobacco habit known as smoking produces the so-called amblyopia. This form of amblyopia is precisely identical in all respects with that produced from the excessive use of alcohol. Both are incurable. I know a number of persons in Louisville who are now practically blind from the excessive use of tobacco. A lady in Portland was forced to admit she had been a secret smoker of tobacco for thirty years. On abandoning the habit, the further progress of her dimness of vis- ion ceased, though there is little or no hope of her regaining that power of perception which she had already lost. She may be considered fortunate in the possession of enough vision to go about and at- tend her ordinary household duties. Smoking to- bacco has never been known to result beneficially to any person in the world. It always lessens the sense of smell and taste; it always contaminates the breath; it always creates an unsteadiness of the muscles, through its irritating effect upon the nerves; and I know from personal experience it diminishes the capacity for mental labor. Now, if you can succeed in inducing even a few people to abandon the habit of smoking, and to pay over to a common charity fund the amount formerly spent for cigars and smok- ing-tobacco, the time may come when public taxa- tion may be reduced, and the condition of the pau- per, who is now miserable, made at least comforta- ble. If the money destroyed by burning cigars and tobacco in Louisville could be paid into the city treasury, it would support all our charitable institu- tions, and pay the entire expense of the street-clean- ing department besides. This would reduce taxa- tion nearly or quite one half, and produce a corre- sponding improvement in the public health.

THE SUNFLOWER IN MEDICINE.

The New York *Medical Record* dilates upon the medicinal value of the æsthetic blossom as follows: —

The sunflower (*Helianthus annuus*) has been, for some time, the object of very serious regard on the part of those who wish not only to live, but to live beautifully. It is just now, perhaps, the most con- spicuous ornament of everything not too purely sa- cred or too rigidly scientific. Medical science is very closely linked with human interests and fash- ions. It becomes us to live up to these, and follow our fellow-man (at a decent distance) in his pres- ent floricultural vagary. We are somewhat sur- prised, however, to find that until lately the medical aspects of the sunflower have been almost completely neglected. It is, indeed, reported that several med- ical students have bought sunflower pen-wipers, and a rural correspondent informs us, incidentally, that he is raising a crop of the genuine plant for the base purpose of feeding his hens. But this is an inad- equate treatment by the profession of the leonine blossoms over which poets sing and ladies rave.

We have to call attention, therefore, to the fact that, medicinally, the sunflower is a thing not to be despised. It is an antiperiodic and a counter-irri- tant of the best kind. About fourteen years ago an article appeared in this journal, showing that the sunflower, freely planted over malarious districts, had the power of dissipating the miasms. A district upon the Scheldt, in Belgium, was said to have been made quite healthy by the growth of this now su- preme form of vegetation. In an address recently delivered by Dr. A. S. Heath before the Farmers' Club, in this city, the utility of sunflowers in keep- ing off malaria is forcibly urged. Farmers who live near marshes or stagnant water are advised to plant them abundantly around these sources of infection. The advantages, pecuniary and æsthetical, of sur- rounding one's self with sunflowers, instead of filling the system with quinine, appear to be very great.

The stalk of the mature helianthus, when dried, forms one of the best natural moxæ. The pith con- tains a considerable amount of nitre, burning slowly and quite steadily. The moxa is not, at present, in vogue, but it must have its fashion again, and there is no time when it could be so easily rendered popular and pleasing. He would be a poor disciple of the beautiful who could not cheerfully endure to be burned a little with art's most popular vegetable expression.

The medicinal value of sunflower oil, or sunflower tea, has not yet been satisfactorily determined. We may look for investigations in this direction from some of our young medical societies. They may find a solid therapeutical basis for the present idol- ization of a flower which, to the conservative mind, seems to be a good deal of an artistic sham.

THE REMOVAL OF SCARS AND CICATRICES.

The *Journal of Pharmacy* furnishes from good sources the following hints on this topic: —

The cicatrices, scars, or marks left by various dis- eases, burns, or wounds of divers kinds are often less obstinately permanent than is generally supposed; and from some facts which have lately come under our notice, we are inclined to think that their pre- vention or removal in many cases may be accom- plished by some mild but effectual antiseptic.

Among the exemplifications of the efficacy of the formula we are enabled to lay before our readers is the case of a gentleman of our acquaintance, whose face was so severely burned by the violent spurting of a quantity of melted lead (owing to a workman having incautiously dropped a wet pipe into it) that his eyes were saved from utter destruction only by pebble spectacles.

At first, of course, carron oil was the sole applica- tion; and as for weeks afterward particles of the granulated metal had literally to be dug out of the flesh, a deeply-scarred countenance was naturally predicted by all, except the patient himself. One mark, of an almost imperceptible character, alone remained after the expiration of six months, owing, as our friend says, to the whole face being bathed two or three times a day, as soon as the oil treat- ment could be discontinued, with a lotion of the sim- plest character, as is readily seen by glancing at its constituents.

Lint soaked in the same solution, and allowed to remain on some little time, will frequently mitigate the visible results of small-pox, and we have known one case of ringworm treated in this way to leave no scar whatever; while a sister of the latter patient, who had had the same disease in a lesser degree, but had not employed this lotion, still retains the evi- dences of the fact. The following is a convenient for- mula for a wash: Borax, ½ ounce; salicylic acid, 12 grains; glycerine, 3 drachms; rose water, 6 ounces.

ANECDOTE OF NÉLATON.

Dr. Caradec gives in *L'Union Médicale* the following anecdote of Nélaton as authentic: A pet dog of the painter Meissonier one day broke one of his legs, rendered friable by over-feeding. Meis- sonier, desolated by such an accident to so beloved an animal, resolved to have recourse to the prince of surgical science, who at that time was Nélaton; but not venturing to declare the true motive, he telegraphed in hot haste for him as if to visit one of the family, then living at their charming resi- dence at Bougival. Nélaton arrived, and, entering the drawing-room, began talking on various topics with the master of the house, who, although he had painted many battles and carried off many victories, knew not how to face the present affair. At last Nélaton, becoming impatient at the delay, and knowing the value of his time, asked, to the great embarrassment of the painter, where the patient was. Presently the wounded brute was brought in on a magnificent cushion, howling with pain in spite of all the care taken. At so distressing a spectacle, Meissonier, forgetting everything else, exclaimed in agony, "Save him! illustrious master, save him!" Nélaton dressed the fracture, and the dog recovered; and shortly afterwards its master wrote a grateful letter to the great surgeon, thanking him for his kindness, and requesting to know his fee. Nélaton replied that when the painter came to Paris he could call upon him. This he soon did, and was produc- ing his purse, crammed with bank-notes, when Néla- ton exclaimed, "Stop, sir! You are a painter, are you not? Just put a gray coating on these two panels which the cabinet-makers have finished!" This was indeed a delicate revenge; but which had the last word? Meissonier, who, going at once to work, at the end of a few days produced two of his *chefs-d'œuvre* on the panels.

MISCELLANEA MEDICA.

Hydrophobia from Fear. — The *Gazette des Hôpitaux*, while noticing a case of alleged recovery from hydrophobia related to the Académie de Mé- decine, observes that it is often difficult to make the distinction between true hydrophobia, due to the ab- sorption of the rabid virus, and the symptoms of hydrophobia, caused by fear of the disease. Was it really hydrophobia of which a woman died at the Hôtel-Dieu, with what seemed to be all the symp- toms of the disease? Several months before, this woman, a street vender, had been bitten by a dog as she was passing Notre Dame, and went at once and had the wound cauterized at the Hôtel-Dieu. From that time she continued perfectly well, until one day, when she was pushing her barrow before the Hôtel- Dieu, she was recognized by one of the students, who called out to her, "Holloa! you are not dead yet, then! The dog which bit your thigh was down- right mad, as they found out at Alfort!" At the very instant the poor woman was seized with a violent pharyngeal spasm, and was at once taken to the Hôtel-Dieu, where she died with all the symp- toms of hydrophobia.

Jewish Military Doctors in Russia. — It is said that the number of Jewish military doctors is to be limited to five per cent. of the entire number of army medical officers. In the Kijew military dis- trict, where they far exceed this proportion, their number is to be brought down to it by gradually drafting them into other military districts. In fu-

ture the number of Jewish students admitted to the military medical academies is to be limited to the same proportion.

SEA-WATER BATHS FOR SMALL-POX PATIENTS. — In the medical circles at San Francisco it is believed that cold sea-water baths are beneficial to small-pox patients. This opinion is attributed to the extraordinary recovery of sixteen men suffering from this disease, who were nearly drowned in the bay in consequence of the upsetting of a boat conveying them to the hospital from the vessel in which they were attacked. When they were rescued it was thought that death would be inevitable, more especially as the patients, after their extrication from the water, were exposed for an hour to a cold wind in their wet clothing. Instead, however, of dying, every one of the sufferers recovered with a rapidity described as "truly astonishing." They had been discharged from the hospital, and were in perfect health.

DR. GALEZOWSKI'S TREATMENT OF PURULENT OPHTHALMIA OF INFANTS. — This consists, according to *Le Progrès Médical*, in touching, morning and evening, the surface of the conjunctiva with a pencil dipped into a solution of one fourth of a part of nitrate of silver to ten parts of distilled water. Immediately afterwards a second pencil is passed over the conjunctiva, after having been dipped in a saturated solution of chloride of sodium. This neutralizes any excess of the nitrate, which, remaining on the conjunctiva, might act as an irritant. This is the plan to be followed, without regard to the abundance of the discharge, the intensity of the chemosis, or the bad state of the cornea; and during the six years that he has treated 400 such ophthalmias at the Clinique, Dr. Galezowski has not lost an eye. Five or six weeks are required to effect a complete cure; but when the discharge has diminished, and the chemosis has disappeared, the application need only be made once a day, then every other day, or twice a week.

THE REMOVAL OF PLASTER-OF-PARIS BANDAGES. — Dr. Murdock states that a very convenient way of effecting this is to take a strong solution of nitric acid, and by means of a camel's-hair pencil to paint a strip across the bandage at the most desirable point for division. The acid will so soften the plaster that it may be readily divided by means of an ordinary jack-knife.

TREATMENT OF DYSENTERY BY THE BENZOATES. — The benzoate of sodium or ammonium, given in fifteen-grain doses three or four times daily, has been found to be of the utmost value in the treatment of acute and subacute varieties of dysentery. It has a decided cholagogue effect, and possibly the good results may be due to the increased flow of bile, and its action on the congested or ulcerated large intestine.

HOT WATER IN THE TREATMENT OF EYE DISEASES is highly recommended by Dr. Leartus Connor. He believes it to be the sole agent which will induce contraction of the blood-vessels without irritating the eye. The water must be as hot as can be borne, and must be thrown against the eye with the hand. It should be used two or three minutes three times a day, or for five minutes every half hour, according to the indications.

SELECT FORMULÆ.

MOSQUITO OIL. — The following is a very good mixture for anointing the face and hands while fishing: —

Oil of tar	1 ounce.
Olive oil	1 "
Oil of pennyroyal	½ "
Spirit of camphor	½ "
Glycerine	½ "
Carbolic acid	2 drachms.

Mix. Shake well before using.

MIXTURE OF OIL OF TURPENTINE. — Oil of turpentine is a medicament that few patients can take without disgust. Ordinary sulphuric ether, luckily, has the property of modifying its persistently unpleasant flavor. The following mixture has been found to be very beneficial in vesical catarrh, neuralgia, and sciatica: —

Oil of turpentine	2 drachms.
Sulphuric ether	1 drachm.

Mix by shaking violently, and add

Syrup of orange flowers	1 ounce.
Water	4 ounces.

A teaspoonful to be taken every two hours.

PETROLEUM IN PHTHISIS. — Dr. M. Milton, of Bradford, Pa., writes: "An article of mine, published in the *Medical Record*, May 13, 1882, on the use of petroleum mass in consumption, etc., has brought me many letters requesting my formula for petroleum pills. The following is my usual formula in phthisis: —

Petroleum mass	ʒ i.
Pulv. cubeba	
Pulv. ipecac comp.	ää ʒ ss.
Sulph. cinchonidia	ʒ i.

"Mix; make four-grain pills. Sig. One pill every three or four hours, or when the cough is troublesome. Also used in chronic bronchitis, asthma, catarrh, and all obscure lung troubles."

DE LA RUE'S OINTMENT IN ERYSIPELAS. — Creasote four parts, and lard thirty parts. The erysipelatous parts to be anointed every two hours.

A SAFE DEPILATORY. — The following is to be preferred to most of the so-called depilatories: —

Carbonis ligni	1 drachm.
Calcis ustæ	4 drachms.
Sodii carbonatis	1 ounce.
Glycerinæ	1 ounce.
Adipis	7 ounces.

This depilatory is applied to the skin for ten or twelve days, when the latter assumes a rose tint, and the hairs may be extracted without pain.

FACETIÆ.

"GOT THE CONVALESCENCE." — The *Germantown Telegraph* is responsible for the following: A country physician of limited sense and "limiteder" education, was called to see Mr. R.'s little boy, who was quite ill. He gave some medicine and left, promising to call on the following morning. When he arrived Mr. R. met him at the gate and informed him that the child was convalescent. "Convalescent?" said the doctor, "convalescent? Then if he is that bad off, you 'll have to call in some other physician; I never treated a case of it in my life!" and with that he mounted his horse and departed.

LADY DOCTORS. — In an interesting collection of autographs, recently sold in London, was a curious one from the celebrated Mrs. Piozzi, formerly Mrs. Thrale, in which, writing from Weston-super-Mare, she says: "Mrs. Piozzi sends her compliments to Mr. Price, by her cook-maid, who wishes — wisely enough — to consult a *professor*, though twelve grains of rhubarb and twelve drops of laudanum in some weak brandy-and-water would have cured her probably; and Mrs. Piozzi never *extends* her practice beyond innocent remedies: begs Mr. Price will set her up as quickly as he can, and drive out of her head the notion of this place disagreeing with her."

THE OLD PROVERB. — A gentleman, who took to medicine late in life, said to a friend, "You know the old proverb, 'At forty a man must be a fool or a physician'?" "Yes," was the reply; "but, doctor, don't you think he can be both?"

MEDICAL CONSULTATIONS. — The following epigram is quoted in a London medical journal, but the author's name is not given: —

"A single doctor, like a sculler, plies;
The patient lingers and by inches dies;
But two physicians, like a pair of oars,
Waft him with swiftness to the Stygian shores."

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Special Notices.

"Hebona" Poison.

THE Rev. W. A. Harrison read a paper, at the New Shakspere Society, On Cursed Hebona (Hamlet I. v.). Presuming that the poison intended must be the same as Marlow's "juice of Hebon," he pointed out that the yew-tree is called hebon by Spenser and by other writers of Shakespeare's age; that in its various forms of eben, eiben, ibben, etc., this tree is named in no less than five different European languages. He shows by citations from medical authorities that the juice of the yew is a rapidly fatal poison; that the symptoms in yew poisoning correspond in a very remarkable manner with those which follow the bites of poisonous snakes; and that no known poison but the yew produces the "lazar-like" ulcerations on the body which Shakespeare in this passage lays such stress upon.

GOOD WORDS FOR ADVERTISERS.

THE Albany Aniline Works are at present extending their buildings so as to cover three acres when completed. They propose to manufacture all the different aniline dyes, many of which can now only be obtained from Europe.

THE notice of our readers is called to the advertisement of Ridge's Food in another column. At this season, when so many little ones are suffering from insufficient food and the various diseases incident to the heated term, it is with pleasure we call attention to an article which is not a medicine, and which, by fifteen years of use here and twenty-five in England, has justly merited the rank it holds with the public. All interested are invited to send to Woolrich & Co., Palmer, Mass., for pamphlets treating of Care of Infants, Composition of the Food, etc.

HORSFORD'S ACID PHOSPHATE affords an excellent means of introducing phosphorus into the system. *The London Saturday Review* said: "The introduction of phosphorus into the system forms a valuable accession to modern treatment of pulmonary phthisis."

This Acid Phosphate has been used by physicians all over the country for night sweats in consumption, with great benefit. It makes a delicious drink with water and sugar only.

LOUISVILLE, KENTUCKY, *April* 22, 1882.

J. C. RICHARDSON, St. Louis, Mo.:

Dear Sir, — I have been a sufferer from nervous sick headache for many years. Lately I have been using your preparation of CELERINA, and I have found it to give me more relief than anything else I have used. I have also prescribed it in a few cases with entire satisfaction. I take pleasure in saying that I think it will supply a much-needed want in the treatment of all neurological diseases. THOS. R. WALKER, M. D.

EVERY STUDENT OF MUSIC in America has just reason to feel proud of the facilities now afforded by the New England Conservatory of Music. The New Home, admirably adapted to the purpose for which it will be used, is situated in the heart of Boston, the home of Art and Music in America. The New England Conservatory is at once the largest music school and occupies the largest and finest building in the world used for such a purpose.

THE first steel pens that were made were sold at an Eagle shilling each. Esterbrook's can be bought by the gross at a cost considerably less than one cent each.

HEALY'S VEGETABLE TONIC PILLS are far preferable to alcoholic compounds in all cases of inflammation.

SENSITIVE organizations constantly derange the nervous functions. CEPHALINE restores them.

Boston Journal of Chemistry
AND
POPULAR SCIENCE REVIEW.

VOLUME XVI. BOSTON OCTOBER, 1882. NUMBER 10.

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Familiar Science.

CHANGES ON THE MOON'S SURFACE.

IT has been well said that scientific like all other human opinion is apt to progress in the same way that the incoming tide encroaches on the beach. Like the wavelets of the tide, opinion advances by steps, and is at one time ahead, at another behind, the knowledge of the age. A very distinct vibration of this sort can be detected in the opinions of students of the moon as to the character of its surface. When the telescope was first employed in scanning our satellite, its resemblance to the earth was found so great that it was at once taken for granted that it was in other respects like the earth; that it had atmosphere, oceans, and living beings. In the course of time the surface was scrutinized more closely, and its analogies to terrestrial conditions were found to be not so close as had been imagined. The mountains were rather craters; the seas were dry; the atmosphere was, at best, very slight. Opinion passed gradually over into the other extreme, until scientific men became generally agreed that the moon was cold and dead, a "played-out" planet, a prophetic picture of what the earth may become when it has cooled down and dried up into an arid wilderness, in which animal or vegetable life is no longer possible. But within the last few years opinion has again started on the other tack, and it is already acknowledged that changes may be, probably are, taking place on what has before been considered a changeless surface. Some of the French observers of the recent solar eclipse detected imitations of an atmosphere about the lunar disk. Two days after the eclipse, an observer of forty years' experience, while looking at the moon, thought that he saw a cloud a hundred miles long and forty or fifty broad hovering over the Mare Crisium, presenting a misty, feathery appearance, unmistakably different from other portions of the moon's disk. If this appearance was a reality, and not an optical illusion, other observers will be sure to detect something similar.

Professor M. W. Harrington, of the Michigan University, and director of the Ann Arbor Observatory, in a recent article on this subject, remarks: —

There are two sorts of changes on the lunar surface which have been established with fair certainty. The first is well seen in the land-slide, and seems to be due to the great alternations of temperature to which the moon is subject. These slides leave traces which can be recognized with little or no ambiguity. At the foot of a cliff will lie a great mass of *débris*, and at the top will be a corresponding notch from which this has fallen. The great walled plain, Plato, shows a land-slide at the south-east end, which must have been upwards of twenty miles in length. The notch in the wall above can be made out without difficulty. In the so-called Great Pass of the Alps, not far west of Plato, numerous land-slides can be seen with a large telescope. The writer has counted upwards of a dozen of them in a distance of sixty or eighty miles. They are smaller than the slip in Plato, but are in some cases large enough to nearly close up the pass, which is from three to five miles in width.

While the changes of the first sort are superficial, and can be explained by mere changes in temperature, those of the second go deeper, and do not as yet admit of any satisfactory explanation. In one of the so-called lunar seas is a crater called Linné, after the great botanist. When described forty or fifty years ago, it was found to be some six miles in diameter, and an easy object. In 1866, one of the very men who had studied it before, and had then agreed with other observers, announced that he could not find it. Later observation showed that it was still there, but was a different object, with a crater of less than a third of the diameter of the original Linné; at the present time it is again an easy object.

Another case is that of the two craters called Messier. They were described as alike by older observers, who, for some reason, paid special attention to them, and made hundreds of observations on them. They are now so dissimilar that the merest tyro in lunar observations sees the difference at first glance. One, perhaps both, have changed their form since they were carefully observed fifty years ago.

Many other changes have been suspected, but they are of a more dubious character. In some cases a slight periodic change in color has been noted which could not be explained by changes of illumination. It should not be concealed that it is always difficult to distinguish on the moon merely apparent from real changes. Several causes combine to make the moon seem to change when it really does not. These are varying illumination, already mentioned, libration, changes in our atmosphere, appearances due only to the instrument employed, etc., etc. But after we have carefully sifted out changes of these sorts, our observations seem to show a residue of phenomena due to the actual changes on the moon's surface. The recent excellent maps of that energetic and accurate observer, Schmidt, of Athens, will make the detection of such changes easier, and additions to our knowledge in this direction may now be expected to accumulate rapidly.

Of course it does not follow, from these possible changes on the moon's surface, that it is inhabited or even inhabitable. The indications of an atmosphere, and of clouds, which imply the presence of water, or some similar liquid that can become vaporized, suggest the possibility that life may exist in some form; but it must be wholly unlike the forms with which we are familiar on our own planet. The atmosphere, at best, cannot be of much extent or density. The facts upon which the theory of its non-existence has been based remain undisputed and indisputable, and the inference drawn from them can be but slightly qualified. The shadows of the lunar mountains are as black and sharply defined as ever, showing that the atmosphere, even if there is one, is not sufficient to diffuse light to any extent appreciable to observers on the earth; the absence of twilight is equally certain; and occulted stars disappear at the edge of the lunar disk, as of old, with no perceptible dimming or distortion of their rays, such as an atmosphere like ours, or far less dense than ours, would inevitably cause. The extreme vicissitudes of climate on the moon would of themselves render her surface uninhabitable by creatures like those on the earth. During the long lunar day — a period equal to about fifteen of our days of twenty hours — the sun pours down his rays, with no atmosphere to temper them; for the supposed atmosphere can be but little better than none for such a purpose. To this super-torrid temperature succeeds the more than arctic cold of the lunar night of equal length. Life may be possible in such a world, as it may in any world, for we cannot set limits to Divine power; but these recent discoveries — if they prove to be such — do not materially affect the question either way.

One thing is certain: no evidences of artificial structures on the moon have been detected or even suspected by observers, though buildings or other works of the magnitude of many on the earth could be easily recognized by our best telescopes. Certain markings, closely resembling parallel canals, have been lately discerned on the disk of the planet Mars; but it is difficult to believe that they are artificial constructions, — unless the De Lesseps type of character is generic among the Martians. However it may be with the men of Mars, those of the moon, if they exist, are evidently no architects or engineers.

BORO-GLYCERIDE.

Professor Barff's new antiseptic, boro-glyceride, of which he first gave a description at a meeting of the Society of Arts on the 29th of March, seems to be exciting much interest at present in England.

The method of preparing the compound is said to be as follows: —

Glycerine is heated to a high temperature, and boracic acid is added as long as it dissolves, the proportions being ninety-two parts of glycerine to sixty-two of boracic acid. When this is allowed to get cold, a white crystalline compound is formed, which disappears on further heating. Water is evolved during the whole of the operation, and at last, when steam ceases to be given off, the mass sets into hard, ice-like substance, and is found to have lost in weight exactly fifty-four parts, which corresponds to the weight of three molecules of water.

The formula for boro-glyceride is $C_3H_5BO_3$, which is analogous to that of a natural fat, BO_3 taking the place of the fatty acid. That the compound is not injurious to health is shown by the fact that milk treated with it was used at a college near London by three hundred persons, during the summer of 1881, without its presence being suspected, or any ill effects being observed.

As a preservative of food, the boro-glyceride is mixed with about fifty times its weight of water, and in this form it costs less than twenty-five cents per gallon. A gallon will preserve as much meat as can be covered by it in any vessel. It can be used by untrained persons, and the same liquid may be employed over and over again.

An English journal gives the following account of Professor Barff's success in the use of this liquid for preserving food: —

He exhibited eggs, oysters, lobsters, fish of various kinds, which had been preserved for nearly three months. These were tasted, and pronounced to be perfect in freshness and in flavor. Specimens of mutton sent from the Falkland Islands in August last were exhibited, both raw and cooked. Professor Barff also read extracts of letters from persons in Jamaica who had received from him cream and other articles in a fresh condition, and a letter from Zanzibar, in which the opinion of Dr. Steere, the Bishop of the African Missions, was given as to the perfect condition in which he received some Devonshire cream. Samples of meat were also shown which had been preserved for three months in open vessels. They were first exhibited in the raw state, in which they appeared satisfactory, and their taste when cooked was also tested by actual experience.

If the new antiseptic proves, upon further trial, to be all that it promises, the value of the discovery can hardly be over-estimated; but the reports we have quoted come from interested parties, and the other side is yet to be heard from.

THE REIGN OF ICE.

The following graphic account of the glacial period is an abstract of a popular lecture by Professor Winchell, delivered at Cottage City this summer in the same series as the one on "World Making," reported in our last number, and, like that, has been revised by the author: —

The rounded stones which are seen lying in abundance on the neighboring beach are examples of "boulders," and loose stones of a similar kind are found scattered all over the Northern States. The unconsolidated sands and clays associated with them are a part of the same geological formation. We call it the "drift." Beneath the drift we always find the surface of the bed-rock smoothed in a remarkable manner, and sometimes scratched and grooved as if by the movement of some powerful tool. All these phenomena, and others, we connect together and explain by means of the theory of continental glaciation.

We must turn our thoughts for a moment to the progress of the world's history. The continents, in the progress of the ages, had grown methodically from their primitive germs. Meanwhile, those wonderful phases of organic history had been passed which we call the "reign of reptiles" and the "reign of mammals." New England had been the seat of these rising and vanishing empires. Organic life had advanced to the grade of the creatures next to man. A finite intelligence would have looked for the advent of man as the next great event. The bounds of the continent, as it was to be in human times, had been attained. It was already covered by the forest growths which were to flourish in the human epoch. Everything seemed ready for the appearance of the lord of the animal creation, and the possessor of the earth's surface.

But still the preparation was not complete. The surface of the land had been wasted and scarred by the erosions in progress during many previous geological ages. The condition of the region of the Colorado River in our times may be taken as representing the wasted and desolate aspect of many portions of the land which had served as the home of countless generations of reptiles and mammals. Before it could become a suitable abode for intellectual and civilizable man, with all the diversified wants and aptitudes and capabilities of such a being, this ruined and exhausted surface must be renovated. Behold the method of nature in the accomplishment of this preparatory work!

In earlier times the completion of the continental outlines had been carried out along the southeastern and southwestern borders. Now it appears that the final work was to be done along the northern slope of America. In accordance with the established method of continent-building, the region now known as British America was gradually uplifted. Increased elevation was accompanied by depression of temperature, and the influence of this was felt by all the middle latitude regions. Unwonted frosts browned the foliage of forests once perennially green, and snows gathered in more northern parts, which the summer's heat was insufficient to dissolve. Perpetual snow clothed British America, which hardened into glacier ice. Thus the country became glaciated from ocean to ocean. Still the cold increased; the southern limits of perpetual snow were extended annually; New England and New York were buried in snow and ice.

Moreover, there was an actual motion of the glacier ice. The glacier travelled. Whatever the explanation of the motion of glaciers, they all slowly descend towards lower levels. Agassiz thought expansion and contraction the cause. James Forbes conceived that they flow like viscid fluids. Faraday, Tyndall, Moseley, and Croll have contributed suggestions, but it suffices for us that glaciers move in mass. The continental glacier moved. Its course was broken up into many eddies and diversions by the configuration of the underlying surface. Partial ice streams flowed along all the old valleys of the continent, — down the Connecticut, down the Hudson, and far out to sea; down the Mohawk, *up* the St. Lawrence from the Gulf to the lower Great Lakes, and at least as far as Fort Wayne, in Indiana. The great movement extended over Long Island Sound and across Long Island. Along the southern shore of the island the glacier sheet plunged into the Atlantic, like the great Greenland glacier into Baffin's Bay. The buoyancy of the water lifted off huge masses, which floated to sea as icebergs. Over the interior the southward extension of the glacier reached the latitude of Cincinnati, and along the Alleghanies the glacier sheet extended to the Carolinas.

The moving glacier transformed the surface. Its thickness was probably five thousand feet in favorable situations, and it pressed upon the underlying surface with a force exceeding comprehension. The fleecy snows had fallen into the gorges and chasms of the ancient surface. They had gathered themselves about the projecting crags and the beetling cliffs, and now the glacier mass held all the rocky prominences in their icy grasp. So, when the ice mass moved, the rugged crags and the loose fragments were wrenched from their places, and borne onward. Each rock fragment, fixed in the under surface of the ice like a ploughshare, scored the surface of the bottom rocks. The finer sands, resulting from the crushing action, scoured the rocky floor, and left it in the condition first mentioned. The worn and rounded rock fragments became our boulders, and the movement of the ice transported them hundreds of miles southward from the places where they originated. Meanwhile, as the front of the ponderous ice mass marched southward, it prostrated the forest growths, and buried them — stem and branch and fruitage — beneath the accumulating rock rubbish. Here we find these relics of the pre-glacial forest, fifty and eighty feet deep in the drift which we explore in human times. By action of this kind all those phenomena were produced which we associate with the drift formation and the age of ice.

But a geological spring-time returned. The continent began again to subside, and the climate of pre-glacial times was rapidly restored. The sudden melting of the ice gave origin to floods, which wended their way southward, and bore an enormous freight of sand and gravel to the wasted regions of the Southern States, which the beneficent action of the glacier had not reached. These deposits overspread all the South. So, by ice and floods, the entire country had been renovated.

But the sinking did not pause. The continent was again submerged by the encroachments of the Atlantic. This also — the despair of any finite intelligence — was a beneficent incident. The continent rose again. As the sea-shore retreated down all the slopes, every foot of land was subjected to the assorting action of the waves. The coarser materials were mostly buried beneath the finer. The land reached its appointed level, and became fitted for the abode of man.

Thus the study and interpretation of the commonest phenomena reveal to intelligence some glimpses of geological history enacted hundreds of thousands of years ago, and light up, as we shall see, even if dimly, the long corridors of time to come.

THE SPEED OF THOUGHT.

We have several times given the readers of the Journal a report of what has been done by scientists to determine the rate at which nervous influence is transmitted through the telegraphic system of our bodies. Some recent investigations on the subject are thus summed up in the *American Journal of Arts and Sciences*: —

Sensations are transmitted to the brain at a rapidity of about 180 ft. per second, or at one fifth the rate of sound; and this is nearly the same in all individuals.

The brain requires one tenth of a second to transmit its orders to the nerves which preside over voluntary motion; but this amount varies much in different individuals, and in the same individual at different times, according to the disposition or con-

dition at the time, and is more regular the more sustained the attention.

The time required to transmit an order to the muscles by the motor nerves is nearly the same as that required by the nerves of sensation to pass a sensation; moreover, it passes nearly one hundredth of a second before the muscles are put in motion.

The whole operation requires one and one fourth to two tenths of a second. Consequently, when we speak of an active, ardent mind, or of one that is slow, cold, or apathetic, it is not a mere figure of rhetoric, but an absolute and certain fact that such a distinction, with varying gradations, really exists.

The method by which these nerve motions are measured is thus described: —

If a cylinder divided into 360° be caused to rotate 1000 times in a second, it is evident that the passage of one of those degrees before a given point is equal to the 1,360,000th part of a second; this may be divided by a microscope, so that a period of time equalling the ten millionth, or even the one hundred millionth, part of a second may be measured. By this arrangement it is possible to measure the rate of nervous impulse. Suppose an electric shock be given to the arm: it produces a sensation and a contraction of the muscles; then, by noting the interval of time between the shock and the contraction, the time occupied by the action of the brain to produce the contraction, however quick, will be ascertained. By trying this experiment on various parts of the body, the amount of sensibility of the different leading muscles may be determined.

UNHEALTHFUL EXERCISE.

In answer to several inquiries as to the value of rowing, riding, walking, tricycling, boxing, cricket, etc., as healthful exercises, *Knowledge* says: —

It will probably sound paradoxical, after the stress we have laid on the necessity for exercise, to say that we consider each one of these exercises, as pursued by specialists, undeniably bad for the development of a well-proportioned and thoroughly healthy frame. Take, for instance, any first-class eleven at cricket; select, if you please, an eleven such as the Australian, in which all-round aptitude is a characteristic feature, and you will invariably find so large a proportion of ill-shaped men as to show that thoroughly well built cricketers owe their goodly proportions to exercises outside cricket. Despite the running involved in the game, four cricketers out of five have badly developed chests. One would say a good bat should have good shoulders; but that batting does not tend to improve the shoulders is shown by two, at least, of the finest Australian bats. Take rowing, again. Unless a rowing man does other work especially intended to correct the defect, he has invariably poor arms above the elbow, a marked inferiority in the development of the chest as compared with the back, and he generally has round shoulders and a forward hang of the head and neck. Boxing is better, but it cannot be pursued with advantage as the chief exercise a man or boy takes; and it is entirely unsuited to girls and women.

SCIENTIFIC BREVITIES.

Progress in Microscopy. — Two microscopes, called the "Jumbo" and the "Midget," formed an interesting exhibit at a recent meeting of a London society. The former instrument, probably made about half a century ago, was 4½ ft. high and weighed 125 lbs., while the "Midget," fully equipped for work, had a total height of only four inches, and weighed but a few ounces. Six such microscopes as the smaller one could be enclosed in the eye-piece of the larger.

Mixture of Gases by Diffusion. — The fact that gases do not mix very rapidly by diffusion alone may be strikingly illustrated by placing a strip of white paper, moistened with acetate of lead solution, inside a tall glass-stoppered cylinder, so that when the latter is inverted the paper extends from the bottom (which now forms the upper end) not more than one third of the total length of the cylinder. A solution of sulphuretted hydrogen in water is then placed in the hollow stopper of the cylinder, and the stopper is inserted loosely into its place. After about ten or fifteen minutes the production of sulphide of lead on the white paper shows that the sulphuretted hydrogen has risen two thirds of the height of the cylinder. Paper moistened with starch and iodide of potassium, and chlorine water may respectively replace the lead acetate paper and the sulphuretted hydrogen water.

Discovery of Mont Blanc. — Mont Blanc, the highest of the Alps, is, strange to say, a modern discovery. At least, no mention is made of this colossus of European peaks in any itinerary, or in any literary work whatever, till recent times. M. Charles Durier, in his work "Le Mont Blanc," says: "This mountain rises in the centre of the most populous and civilized states of Europe; it is, in fact, the axis around which European civilization has revolved and still does revolve; its height is considerable; it dominates everything in its vicinity, and, to make its appearance more striking on the background of the blue sky, its summit, though placed in a favored, temperate latitude, is ever covered with a mantle of snow. And yet, during twenty centuries, no historian, no traveller, no *savant*, no poet names it, or so much as alludes to it. As the sun describes his daily track, that peak throws its shadow upon at least three countries possessing different languages, but still it was profoundly ignored." The same author informs us of a map of the region round about Mont Blanc, published in the second half of the sixteenth century, but which gives no hint as to the existence of the mountain, which, nevertheless, is visible from all sides at distances of sixty leagues.

The Odor of Cedar. — The pleasant odor of cedar, according to Mr. E. Lewis, appears to be as persistent as the wood itself. Slivers taken from white cedar stumps found 12 ft. under water at low tide, near the Narrows entrance to New York harbor, had the odor of the newly-grown wood, and a piece not more than twice the size of one's finger perceptibly scented a drawer for more than a year. "It is certain," says Mr. Lewis, "that the coast where the trees of which these are the stumps grew has since undergone a depression of 18 to 20 ft., an event which may have occupied as many centuries."

Water in Flesh. — Analyses have been made by Prof. C. Virchow of the amount of water and extract in the flesh of different animals, with the view of obtaining some general data for the introduction of a method whereby the value of meat might be determined. The differences were so slight, however, that no results of any value were secured. Veal contained more water than beef, lean beef had less than well-fed beef, and unhealthy meat a greater amount than sound meat. The same holds good for the extract.

Expansion of Metals on Cooling from Fusion. — An interesting series of experiments are reported to have been made by Messrs. Nies and Winkelmann on the changes in volume of a number of metals on cooling from fusion. Of the eight metals (tin, lead, zinc, bismuth, cadmium, antimony, iron, and copper) submitted to investigation, six, namely, tin, zinc, bismuth, antimony, iron, and copper, expanded at the moment of solidification; so that the solid is less dense than the liquid metal. The results obtained with the remaining two metals were not decided, though it is believed that they also expand on solidification. The authors are of opinion that their experiments indicate the existence of the general law that all metals expand on solidification.

Didymium. — Mr. B. Brauner has redetermined the atomic weight of didymium, and gives 145.4 as the correct number for a purer sample, instead of 146.6, as previously arrived at; but his experiments suggest the possibility that didymium is like cerium, a compound which may be split up into at least two elements, the atomic weight of one being under 145.4, and of the other over 146.6.

Science on the Stage. — It is proposed to try a novel experiment at Paris, by producing a series of scientific dramas at one of the theatres, with the object of combining amusement with instruction. Three plays have already been provided, and their titles clearly indicate the direction in which the audience is to be instructed. The titles are: "Denis Pepin, or the Invention of Steam;" "Kepler, or Astronomy and the Astrologer," and "Gutenberg, or the Invention of Printing." The result of this new dramatic venture will be awaited with interest. Its success may be the inauguration of a new era in science teaching.

Modern Mastodons. — Recent discoveries in Indiana give a much more recent date to the mastodon than has been generally assigned. In one skeleton the marrow of the huge bones was still capable of use, and the kidney fat was replaced by lumps of adipocere. In another, found in Illinois, there was every evidence that it had lived upon the vegetation of the present day, — upon the grasses and herbs that now grow in the vicinity.

ELECTRIC SPARKS.

The Electric Light in Libraries. — Perhaps no places stand more in need of electric light than libraries and reading-rooms. Hitherto many libraries have refused to submit their costly books to the risk of fire and the certainty of a slower but not less real destruction by heated air, which the use of gas always involves. The discomfort to readers is equally great, and to brain-workers there is more than discomfort; there is danger, from a kind of brain-stewing, which increases fatigue, impairs the working powers, and in the long run undoubtedly shortens life. From these evils the new light is free. No wonder, then, that its use is rapidly spreading. The Royal Library at Brussels is the last, so far as we have heard, to adopt it, using a "lampe-soleil" of MM. Clerc and Bureau, Belgian inventors. It is described as being much more steady than other arc-lights, of very agreeable color, not at all trying to the eye, but, on the contrary, soothing, and costing only one fourth as much as its competitors. The hall is lighted by three of these lamps as well as it would have been by 125 gas jets of sixteen candle power. The difference in the heat evolved is enormous. The light is all thrown up on to the ceiling, and thence reflected through the room. In this way the strong lights and shadows, which are usually the worst feature of arc-lights, are avoided; the light at the reading-table is agreeable, and every alcove is sufficiently lighted to make it easy to find the books.

Curious if True. — The following, from a New York paper, is very improbable, to say the least: It was recently noticed that horses passing through Nassau Street, near Ann Street, sprang as if frightened when passing over a particular spot. It afforded much amusement for the crowd until somebody guessed that the horses were getting shocks from leaks in the electric light conductors. This proved correct, for the fun ceased when the current was turned off. The investigation which followed showed that an earth current had been accidentally established between two ground-

ings: one through a loose cap on the end of a service pipe to a house near the scene of the trouble, and the other through a light wire attached to a gas pipe in a building some distance away. The jarring caused by heavy trucks passing the house containing the service pipe with a loose cap on its end caused intermittent communication between the ends of the conducting rods and the iron protecting tubes in which they are placed. The latter, in direct contact with the damp earth, diffused a part of the current intermittently along the line, which is only twenty inches or so below the surface. At the spot where the horses were frightened was a short length of dry earth, around which the intermittent current passed through the animals when their fore and hind feet were on the damp earth. Horses seem more sensitive than men to the current, for experiment with bare hands connecting the same spots failed to detect any current. The galvanometer, however, showed a feeble current, of seven or eight cells of a common battery. The accident was due to the carelessness of a hurried workman.

Practical Chemistry and the Arts.

TESTING SOAP.

A COMPLETE analysis of soap requires the highest skill of the practical chemist, but there are some tests which the consumer can apply, and which every large consumer should apply, before purchasing a quantity of this much-adulterated substance.

The simplest test is to dissolve it in alcohol. If it all dissolves in hot alcohol, leaving no residue, it is free from carbonate of soda, from starch, and mineral adulterants such as sand. If a current of carbonic acid gas passed into the clear alcoholic solution causes no turbidity, produces no precipitate, there is no free caustic alkali, soda or potash, present; for the carbonic acid would convert it into a carbonate, which is insoluble in alcohol. If there is any residue insoluble in alcohol, it may be various things. If it is soluble in water, and is alkaline, it is probably carbonate of soda; if it does not dissolve in water, heat it strongly, and if it burns it is probably starch (test for it with tincture of iodine) or sawdust; but if it refuses to burn, it is probably silica (sand) or soapstone.

Good soap contains twenty to thirty per cent. of water, but some soaps contain as much as sixty, or even more. Of course no one wishes to buy water and pay the price of soap for it. To determine the quantity of water in soap it is necessary to have a little pair of scales and some weights. Cut off several thin slices of soap from different parts of the bar, within as well as without, weigh very carefully, and then dry them at a moderate temperature, afterwards at the heat of boiling water. The loss is water.

The most frequent adulterant of soap is rosin, and unfortunately it is very difficult to detect with certainty, and almost impossible to estimate with accuracy. Allen says that rosin gives a dark color to the liquid obtained by adding brine and caustic soda to a solution of soap, and then removing the precipitate. Rosin makes the soap softer, and gives it a peculiar sticky feeling, that can be recognized by a little experience.

The comparative value of different samples of soap can be easily determined by a method the opposite of that used for determining the hardness of water. Make a dilute solution of chloride of calcium, either by dissolving that salt in water, or by dissolving pure marble in hydrochloric acid, evaporating to dryness, and dissolving in water. Dissolve the same amount of each sample of soap, say one gram or fifteen grains, in fifty per cent. alcohol, and add a measured quantity of the chloride of calcium solution to each, in a corked bottle. If, on shaking, a froth is formed that lasts several minutes, add more of the chloride of calcium until no persistent foam is any longer produced. The value of the soap is directly proportional to the quantity of chloride of calcium solution required to destroy it.

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ON A METHOD OF CONSTRUCTING AREOMETERS WITHOUT STANDARD SOLUTIONS.

BY G. S. EYSTER, A. M., PH. D.

IT is not unfrequently required either to construct an areometer with some special scale, or to test the accuracy of one purchased from instrument makers. The following method is one I have used with ease and success.

We know from hydrostatics that the fluid displaced by the immersed portion of an areometer is equal in weight to the weight of the entire instrument.

Let $v =$ the volume of the immersed portion of the areometer, and $w =$ the weight of the areometer, and $g =$ the specific gravity of the fluid; then from the above statement we shall have: —

$$(1)\quad vg = w;\ \text{from which}$$

$$(2)\quad v = \frac{w}{g}$$

$$(3)\quad g = \frac{w}{v}$$

From these equations it is easy to calculate the weights which we must add in graduating or testing a hydrometer.

Let us suppose that it is required to construct an areometer having a range from the density 1.1 to 1.15, and to have a scale divided into 10 equal divisions.

We slip an arbitrary scale into the stem of the blank, and take care that it does not change its position during the progress of the experiment.

The instrument is then weighted so as to sink the stem in distilled water at 15°C., until the level of the water reaches the point where we wish to locate the 1.15 division.

It is best to read from the *top* of the meniscus, some instrument makers and books to the contrary notwithstanding. Any one who has used an areometer in a dark and almost opaque liquid will appreciate the force of the above remark.

The point at which the top of the meniscus cuts the arbitrary scale is then noted. It is best to repeat this a number of times, and to make sure that the instrument is free from grease and air bubbles, and of the temperature of the water. Any other temperature can be used instead of 15°C.; but in case this differs much from the temperature at which water is taken as unity, a correction is necessary, owing to the alteration in density due to temperature.

The next step is to calculate the weight of the instrument when completed. Let the instrument, as now loaded to the 1.15 mark, be 23 grams; then the volume of the areometer will be from (2),

$$v = \frac{23}{1.00}\ (1.00 = \text{sp. gr. water}) = 23\ \text{cc.}$$

If now the areometer is placed in a solution 1.15 sp. gr., it must still displace 23 cc. in order to sink to the same mark; but in this case the weight must be increased, or (1)

$$23 \times 1.15 = w = 26.4\ .$$

Hence the completed instrument weighs 26.45 grams.

In order to find the volume of the instrument at 1.1, we substitute in (2)

$$v = \frac{26.45}{1.1} = 24.045\ \text{cc.}$$

The difference of volume, then, between the instrument at 1.1 and 1.15 is $24.045 - 23.0 = 1.045$ cc.; and it is plain that in order to sink the instrument in pure water from 1.15 to 1.1 we must add 1.045 grams. We observe, as before, the point on the arbitrary scale indicated by the top of the meniscus. A slip of paper is then pasted around the stem, with its upper edge exactly even with one of the determined divisions on the scale; the scale is removed, and a new scale is formed by laying off the distance between the two points on a piece of paper, and dividing the interval into ten equal parts. The scale is then cut to the proper size to enter the stem. The whole areometer, scale and all, is so adjusted that its weight is 26.45 grams. The scale is then wrapped around a piece of wire, or thermometer tube, a little tongue having been first cut at each end; a small portion of mucilage is put on it near each extremity, and then it is carefully pushed into the stem, and its position adjusted by means of the slip of paper before mentioned. This slip is best cut from a ready gummed label, and another piece of the same size used as a counterpoise whilst adjusting the weight. A wet towel is then wrapped around the areometer as far as to the end of the scale, and the open end closed by rotating it carefully in a blast-lamp flame.

In order to test an areometer already made, it is necessary to have a solution that will float the instrument at the lower part of the stem. The specific gravity of this solution is then determined, which gives the value of the division at which the instrument floats.

Suppose this point to be 1.15, and the density of the solution 1.14; the point is 0.01 too high. To find whether some other point, as 1.1, is correct, we must add a weight equal to the difference in volume between these points, multiplied by the sp. gr. of the fluid; that is, 1.14. To find this weight, let 26.45 grams be the weight of the instrument; then from (2)

$$v = \frac{26.45}{1.14} = 23.202\ \text{cc.}$$

$$v = \frac{26.45}{1.1} = 24.045\ \text{cc.}$$

$24.045 - 23.202 = .843$ cc. $=$ the difference in volume between the points 1.14 and 1.1.

In order to find the weight necessary to sink the scale through this interval, we multiply .843 cc. by $1.14 = .961$ grams. We add this weight, and find the point indicated is 1.11. Hence the divisions are at the proper distance apart, but the whole scale is .01 too high. Other points can be tested in the same way.

The weights can be made in the form of caps of lead and tin foil, which can be placed on the end of the stem.

Unless the instrument is very unstable there will be no trouble in floating it perpendicularly; the smaller the stem in proportion to the bulb, the less trouble in adjusting the weights as regards stability.

If the instrument is for densities less than 1.0 the same methods can be used. In this case, in the final adjustment of the weight, the weight of the entire instrument is diminished. In testing such instruments, in many cases, water can be used; and the weights necessary to sink them to any point will be obviously equal to the volumes of the instruments at that point.

DYNAMOGEN is the name of a new explosive, invented by M. Petri, a Vienna engineer. If the enthusiastic claims of the inventor are not an exaggeration of its merits, it will certainly prove a dangerous rival of gunpowder.

WELDING BY PRESSURE.

At a recent meeting of the Physical Society, London, Prof. W. Chandler Roberts communicated the results he had obtained in repeating the experiments of M. W. Spring, professor at the University of Liège, on the union of finely divided particles of metal by pressure. M. Spring had shown that at a pressure varying from 5000 to 7500 atmospheres metallic filings may be united into coherent disks. Thus, at a pressure of 6000 atmospheres, bismuth filings may be united into a disk, which has a crystalline fracture, and a density which is identical with that of the metal cooled from the molten state. Zinc, again, also a very crystalline metal, will weld into a disk at a pressure of 7000 atmospheres, 105,000 pounds to the square inch, and the metal will even "flow" into cracks between the die and the collar surrounding it, just as in the experiments of M. Tresca lead "flowed" under similar circumstances. Professor Roberts had repeated and confirmed many of the experiments of M. Spring, whose more recent results are of special interest, as he has shown that if filings of bismuth, lead, and cadmium be mixed in suitable proportions, such, for instance, as in Wood's alloy, and if the mixture be submitted to a pressure of 7500 atmospheres, 112,500 pounds to the square inch, an alloy is obtained which will actually fuse at 70° C., the true fusing point of Wood's alloy being 63° C. Professor Roberts showed to the society an alloy he had prepared, which melted below 100° C., although of the constituent metals the lowest melting point is 230° C., and he pointed out the great interest, both to the physicist and metallurgist, of M. Spring's results.

INDUSTRIAL MEMORANDA.

A Self-Winding Clock. — At the Paris Exhibition of 1878, Mr. A. Dardenne, a Belgian, exhibited a model of a self-winding clock, which has since been improved in such a manner as to merit further notice. A specimen clock was fixed at the Gare du Nord Terminus, Brussels, last September, and after six months' trial it was found to agree exactly with the Observatory clock, not having varied in the least during that time. The clock is wound by a small windmill, which is put in a ventilation pipe, chimney, or any other place where a tolerably constant current of air can be relied on. This windmill is, by a reversed train of multiplying wheels, continually drawing over a wheel an endless chain, in one loop of which the clock-weight is supported. As the loop hangs between the clock and the winding machine, the weight is continually drawing through the clock the slack chain drawn up by the wind motor, and thus a constant motion is maintained. A ratchet wheel prevents the motor from turning the wrong way, and, by a simple arrangement, whenever the weight is wound right up to the top, the motion is checked by a friction brake automatically applied to the driving mechanism. When the weight is thus raised to the top, sufficient energy is stored to insure the proper working of the clock for about twenty-four hours, and it will therefore be seen that a perfectly regular current of air is not essential. It is said that Mr. Dardenne is now supplying these clocks for domestic purposes, and their freedom from disturbance and ease of management are arguments in favor of their adoption.

Economical Soap. — The properties of soap and of silicate of soda possess great analogy. The combinations of weak acids possess a slightly alkaline reaction, their solutions being capable of forming an emulsion with fatty substances. These properties in common have led to the manufacture of cheap soaps, containing a large proportion of silicate of soda or soluble glass. Two processes may be employed: (1) the addition of a concentrated solution of silicate of soda to fatty or resinous soap; and (2) the saponification of fatty or resinous substances by alkalies in the presence of silicate of soda. By either method a soap is obtained, suitable for all the uses to which ordinary soap has hitherto been applied, and at a much lower price, as silicate of soda is extremely cheap.

Glycerine and Glue. — A German chemist named Puscher, a native of Nuremberg, reported to the trades-union of that place that he met with great success in using glycerine together with glue. While generally, after the drying of the glue, the thing to which it is applied is liable to break, tear, or spring off, if a quantity of glycerine equal to a quarter of the quantity of glue be mixed together, that defect will entirely disappear. Puscher also made use of this glue for lining leather, making globe frames, and for smoothing parchment and chalk paper. He also used it for polishing, mixing wax with the glycerine, and using it as an underground for laying on aniline red color. The red was found to exceed all others in which glycerine is not used. The glycerine has also some properties in common with india-rubber, for it will blot out pencil marks from paper, so as to leave no mark whatever. A paste made of starch, glycerine, and gypsum will maintain its plasticity and adhesiveness longer than any other cement, and therefore recommends itself for cementing chemical instruments and apparatus used by pharmacists.

Scarcity of Ivory. — It is stated in the *Engineer* that on May 15th there were only 127 1-2 tons of ivory in stock in London. The smallest stock for many years was in March last, namely, 107 1-2 tons; the largest in July, 1878, namely, 301 1-4 tons. At present there are probably in dealers' private warehouses about 40 tons, while at one time the private dealers used to hold over 100 tons in their own warehouses. Eight ivory cutters in Sheffield cut up £124,000 worth of tusks in a year, and the two largest cutlery houses add a value of £16,000 each per annum to that total. One fourth of all the ivory imported into England is used in Sheffield for cutlery hafting, and other purposes. It does not appear that any really satisfactory substitute for ivory has yet been produced. The material known under various names, but generally called celluloid, has not served more than a limited purpose. The same may be said of vegetable ivory. None of these things will take the peculiar polish of ivory. An enormous trade could be done in a really satisfactory substitute for the elephant's tusks.

LABORATORY NOTES.

Preparation of Oxygen. — M. d'Arsonval has invented an apparatus for uninterruptedly preparing oxygen without the agency of heat. The principle is based on the mutual decomposition of peroxide of hydrogen and chromic acid. The apparatus is composed of two flasks, one containing clippings of binoxide of barium, the other bichromate of potassium dissolved in hydrochloric acid in excess. The two flasks are connected by an india-rubber tube, which also conveys the stream of chromic solution to the binoxide of barium. The hydrochloric acid in excess in contact with the binoxide produces peroxide of hydrogen, which, in contact with chromic acid, decomposes, and causes the chromic acid to decompose. Thus there is a stream of oxygen generated by two distinct decompositions, and which is easily regulated by controlling the flow of the liquid.

Testing the Purity of Nitrate of Silver. — A method of testing nitrate of silver for purity is to dissolve it in the smallest possible quantity of water, filter, and drop in hydrofluosilicic acid. If turbidity is produced, an alkaline salt is indicated. Should the solution remain clear after several drops of the acid, it is mixed with an equal bulk of alcohol, when any alkali is at once precipitated. To detect nitrous acid and nitrites, the liquid is evaporated as much as possible, and a solution of 1-100th per cent. of magenta in glacial acetic acid added. If nitrous acid or nitrites are present, the liquid changes color, turning from violet to yellow. Free mineral acids also cause a similar change; but if water is added, the red color is restored in that case.

Purification of Sulphuric Acid by Crystallization. — In the *Zeitschrift für Analytische Chemie*, Tjaden Moddermann remarks that he has for some time been accustomed to prepare pure sulphuric acid by recrystallization of the hydrate $H_2SO_4H_2O$, and finds this seldom-adopted method of purification to be really an excellent one. The author has experimented in this way upon acids containing considerable quantities of lead and arsenious and nitric acids, etc., and by protracted recrystallization has in all cases obtained a pure acid from them.

The method is very simple. The acid is mixed with sufficient water, and, in bottles two thirds full, exposed to the cold in the open air on a frosty night. If the mixture has been properly made, it is generally frozen throughout the next morning. The chief thing then is to carefully separate the crystals from the mother-liquor, and for this purpose the author employs a centrifugal apparatus, so constructed that the acid only comes in contact with glass. The separation is very easily effected, and except in cases where an acid is strongly contaminated with the different oxides of nitrogen, one recrystallization is generally sufficient.

Lithia and Boracic Acid in the Water of the Dead Sea. — Dieulafait found in one cubic centimeter of Dead Sea water enough lithia to show the spectrum of this substance at least a thousand times. The same water contains also so much boracic acid that it can be practically recognized in the residue from a single cubic centimeter of the water. Hence he infers that the present waters of the Dead Sea are the residues of the evaporation of an inland sea analogous to the Caspian or the Kara Boghaz.

PRACTICAL RECIPES.

Cement for Glass and Metal. — Every one who uses brass letters on glass windows, and knows how often they drop off from unequal expansion or from the too energetic efforts of window cleaners, will be glad to have the following receipt: —

Litharge	2 parts.
White lead	1 part.
Boiled linseed oil	3 parts.
Gum copal	1 part.

Mixed just before using, this forms a quick drying and secure cement.

To Bleach Straw. — About nine ounces of permanganate of potash are dissolved in one gallon of warm water. This is done in an earthenware vessel, and cold water is then added until the liquid takes a dark red color. The straw is left for about six hours in a tepid and weak solution of soda crystals. It is then washed carefully and introduced into the permanganate solution, in which it is continually agitated. As soon as it has taken a light brown color, it is dipped in cold water, then in a bath of bisulphite of soda, strong enough to be smelled. In this bath the straw is left for fifteen minutes, and when taken out it is perfectly white.

Glass Coating on Metals. — The following method has been suggested for coating metal surfaces with glass, which may be found to answer various purposes. Take about 125 parts (by weight) of ordinary flint glass fragments, 20 parts of carbonate of soda, and 12 parts of boracic acid, and melt. Pour the fused mass out on some cold surface, as of stone or metal, and pulverize when cooled off. Make

a mixture of this powder with silicate of soda (water-glass) of 50° B. With this coat the metal to be glazed, and heat in a muffle or other furnace until it has fused. This coating is said to adhere very firmly to steel or iron.

GLACIALINE. — According to Dr. Besana, this substance, which has met with so much favor in England and elsewhere as an antiseptic, especially for the preservation of milk, meat, and other articles of food, has the following composition: —

Boracic acid	18 parts.
Borax	9 "
Sugar	9 "
Glycerine	6 "

A Roman composition of a similar kind was found to be nothing but pure boracic acid. It is called salt of glacialine, and sells at five francs per kilogram (about 45 cents a pound), the market price of boracic acid being exactly half that rate.

Agriculture.

A SUMMER WITHOUT RAIN.

THE summer of 1882 will be long known as the summer without rain. The drought, however, was somewhat local, extending over the New England States, and being most severely felt in Eastern Massachusetts. At our farm in Essex County, only three sixteenths of an inch of rain fell in the interval between the 5th of July and the 5th of September, and during that period the most intense heat prevailed. The fierce rays of an unclouded sun were poured upon growing vegetation for sixty consecutive days, the thermometer ranging during the time between 80° and 90° F. The crops of every kind were virtually destroyed, and tillage lands and pastures have been dried so that not a green blade of grass can be seen. It is the first summer for a quarter of a century that the corn crop at the farm has failed; indeed, not for a century, probably, has the corn crop been so effectually destroyed by drought. It is the crop *par excellence* which withstands the influence of long-continued dry weather, and instances are exceedingly rare when corn has been materially injured from the withholding of rain. This season it has been almost a total failure in several of the New England States, and the dwarfed plants have been cut up and fed to animals taken in from the parched grazing-fields. Corn planted for ensilaging has also failed, and many silos will remain empty during the winter. It is a great hardship for farmers to see their crops dry up in the fields, and many are greatly discouraged. Potatoes have also failed, and very large areas were devoted to their culture the past season, owing to the scarcity and high prices which prevailed during the spring months.

The hay crop in New England was a large one, but in the absence of a second crop, and from the need of farmers saving their herds of animals by feeding from their barns in the hot weather, the winter's stock of hay will be small. Altogether, the season has been one of the most discouraging experienced by farmers for many years, and the aggregate of losses will be many millions. If the New England States were as isolated as they were one hundred years ago, a famine would probably occur, or at least there would be a scarcity of food which would cause great anxiety and suffering. But with railroads penetrating into the South and far West, an abundance of food, raised under more favoring circumstances, will be brought to our doors, and all will be fed. It is almost, or quite, impossible for crop failures to extend over the vast territory of the United States; and probably the time will never come when there will be an alarming scarcity of food in this country. It is something to live in such a country, for, of all calamities, none can be greater than famine.

WEEDS.

THE wonderful tenacity of life possessed by troublesome weeds has been shown in a striking manner during the extreme drought of the past summer. On fields and on lawns where the grasses have become thoroughly dried, and apparently killed, some of the worst weeds have managed not only to live, but to flourish in the burning sun. It has indeed been interesting to study the habits of weeds under the exceptional conditions of soils in the past three months. The dandelion, a vile plant on lawns, has at no time during the months of absence of rain shown the least indication of dying out. It accommodated itself to the conditions, and, crowding down into the turf, spread out its broad leaves to shelter its roots, and waited in greenness and serenity for "better weather." Examination of these plants, at a time when the ground for a distance of three feet below the surface was entirely without moisture, disclosed the interesting fact that directly around the root, and under the crouching leaves, there was always moisture in the hottest hours of the day. The leaves served as a mulch, preventing evaporation, and the roots had pushed down to a point far deeper than any grass roots could go. It is probable that no drought that can occur in summer would have a destroying influence upon this plant. It withstands the influence of excessive moisture equally well.

In the driest weather our gardener was directed to use a long narrow knife in cutting off the roots of the plants, at a point four or five inches from the surface, with the view of destroying them. Within sixty hours, without a drop of rain, and the soil without moisture, the plants sprouted from the root stump, and came up vigorously, and covered the spot as before. The cutting of the plants again, and covering the fresh incision with a few grains of salt, did not arrest growth; but a drop of strong sulphuric acid applied directly to the wound apparently destroyed vitality. It is not certain, however, that in the spring they will not again appear in unusual freshness and vigor.

What has been stated regarding the dandelion, and its tenacity of life, applies to most noxious weeds, and the question comes up, Why is it that plants that we do not want, that are an injury to fields, have capabilities of growth, when valuable plants around them are killed? It seems to be a law in nature that whatever is detested, and efforts are made to destroy, possesses powers of endurance and resistance which endow it with remarkable vitality. We can see no good reason why worthless weeds should exist at all; apparently they serve no good purpose in the world. If we could remove them from our fields as readily and as effectively as we can the wheat or the maize plants, it would not be long before they would cease to annoy us. It is probable that everything that grows exists for a purpose, and whatever is regarded as an enemy, and needs protection, is endowed with a tenacity of life corresponding with its needs. It is so in the animal world. The most repulsive and useless animals are usually the hardest to destroy. The *Mephitis Americana*, or common skunk, is generally given a wide berth, as no one wishes to attack him unless compelled to do so; the consequence is, the animal is rapidly increasing; they were never more numerous or troublesome than during the present season. Among human beings the same law appears to prevail, the useless and vicious outliving the worthy and valuable members of society. We observe much in the world which it is difficult to understand.

ANTS AS INSECTICIDES.

DR. A. WAKEFIELD, of Jacksonville, Florida, sends us the following note: —

In the JOURNAL for August I see an article, "Ants as Insecticides," and having had my attention called to the subject of late, I will give you a suggestion made to me by a planter near this city, who has an orange grove bearing very fully this year, while all the groves that I can hear of are making very little fruit.

He attributes his success to using the "ants as insecticides," by inducing the ant to hunt for food on his trees by the following method. He makes a strong solution or mixture of common Florida syrup and water, and with a syringe applies it as thoroughly to his trees as he can; and when the water dries, the saccharine substance adheres to the leaves, twigs, and trunk of the tree, in seeking after which the ant destroys the insects that infest the trees and destroy the blossom in the bud or after the young fruit has set, thus ruining the future crop.

If the suggestion should be new to you, or of any benefit to the wide world to whom the JOURNAL is a most welcome visitor every month, you are at liberty to make such use of it as you please.

Dr. E. U. Jones, of Taunton, Mass., also writes as follows: —

During the last two weeks of July I was cursed with an invasion of the "army worm," and, after I had recovered from my first chagrin at the prospect, I began to enjoy the antagonisms between the ants and the worm. If the ant attacking the worm was the large black ant, but one usually engaged in the contest. The ant usually took the worm by the "nape of the neck," and the struggle then was between the strength of the ant and that of the worm. The bite of the ant did not seem to kill the worm at once, but the struggle sometimes lasted for fifteen minutes, always resulting in a victory for the ant. It was then dragged to the ant's quarters.

If the attack was made by the small red ant, two usually took the work. One would make the attack, but would soon require assistance. The attack in this case was usually at the rear, and both ants would pull in one direction and the victim in the other. Sometimes the ant would go away to seek help, and, upon returning, could not find the worm, and thus the enemy would escape. If I placed the ant close to the very worm it had lost, it would not seem to recognize the fact, but would run wildly about, as if in a state of perplexity. It may have been because I touched the ant; it may have been because the worm had moved from the exact place where the ant had left it; but it could seldom be made to attack the same worm again. I felt sure, however, that could I have had ants enough I should have had my worms destroyed.

A correspondent in Burnt Hills, N. Y., writes: —

I have some fine ivies that are infested with a parasite that is extremely hard to get rid of. A year ago I thought I should lose the plants, but upon looking them over, after putting them out-of-doors, I was much pleased to find that the ants were doing for me what I could not do myself: they were killing the insect. So well did they work that in a few weeks my vines were in a first-class condition.

Our friend encloses an ivy-leaf, with some dried specimens of the parasite upon it, apparently a kind of "scale insect," so called.

Another correspondent sends us the following, cut from the Philadelphia *Saturday Evening Post* of November 20, 1880: —

Many of the leading orchard proprietors in Northern Italy and Southern Germany are cultivators of the common black ant, which insect they hold in high esteem as the fruit grower's best friend. They establish ant-hills in their orchards, and leave the police service of their fruit trees entirely to their tiny colonists, which pass all their time in climbing up the stems of the fruit trees, cleansing the boughs and leaves of malefactors, mature as well as embryotic, and descending laden with spoils to the ground, where they comfortably consume or prudently store away their booty. They never meddle with sound fruit, but only invade such apples, pears, and plums as have already been penetrated by the canker, which they remorselessly pursue to its fastnesses within the very heart of the fruit. Nowhere are apple and pear trees so free from blight and destructive insects as in the immediate neighborhood of a large ant-hill five or six years old.

Since the above was in type we learn that Dr. C. T. Macgowan has sent Prof. C. V. Riley, of the Agricultural Bureau, Washington, from Han Chow, an account of a curious use made of ants in that part of China. It seems that in many parts of the province of Canton the orange-trees are injured by certain worms, and, to rid themselves of these pests, the inhabitants import ants from the neighboring hills. The hill-people throughout the summer and winter find the nests of two species of ants, red and yellow, suspended from the branches of various trees. The "orange ant breeders" are provided with pig or goat bladders, baited inside with lard. The orifices of these they apply to the entrance of the bag-like nests, when the ants enter the bladders, and, as Dr. Macgowan expresses it, "become a marketable commodity at the orangeries." The trees are colonized by placing the ants on their upper branches; and bamboo rods are stretched between the different trees, so as to give the ants easy access to the whole orchard. This remedy has been in constant use at least since 1640, and probably dates from a much earlier period. It is certainly a new way of utilizing ants, which, as a rule, are deservedly considered a nuisance by the horticulturist.

AGRICULTURE IN THE NEWSPAPERS.

Some of our leading city journals have the good sense to entrust their "agricultural department" to an expert who can manage it with ability and judgment; but the agricultural articles and items in the average newspaper are generally worthless, or worse than worthless. In England the standard in this respect is even lower than here, for the first-class city papers seldom employ a competent man to conduct this department. The London *Agricultural Gazette*, in a recent number, administers the following reproof to the *Standard*, which had charged the agricultural journals with spreading exaggerated or "sensational" reports as to the state of the crops, etc.: —

Now it must be said that this behavior is a little impertinent. An editorial clique cannot really be omniscient, however much it affects to be so. If it wants special knowledge, to obtain it it must go to those who have it. Do the London daily papers seek for the assistance of men who really understand the subject to supply reports of farm business? If "agricultural reports" need discounting, what have the *Standard* and its contemporaries done to improve their quality? It seems to be considered by the London editors that anybody will do to write on farming, to report a corn or cattle market or an agricultural show. The average reports given of these in the daily papers are almost invariably ridiculous endeavors to cover ignorance with a platitude of words. The phrases are glib enough, but, where the information is not untrue, it is generally too loose to have the smallest value; and, when any precise statement is ventured on, it has generally been caught up, and misunderstood, and stated so as to convey a different meaning from that which the speaker intended. When the *Standard* has taken some pains to rise above the level of its class, that is, to get first-hand news about farm matters, — markets, shows, and crops, — it will be entitled to criticise "agricultural reporters." Meantime, it had better lay down the rule to its leader writers, Before you choose an agricultural topic it will be just as well to ask yourselves the question, "Do I know anything about it?"

GLEANINGS.

A Curious Tree. — Lieutenant Houghton, who has recently visited New Guinea and several other groups of islands in the Pacific, reports the existence of a prehensile tree. It appears to be a species of Ficus, allied to the well-known banyan-tree, which throws out from its branches air roots, that eventually reach the ground, and take root there, and in their turn become new stems, which perform the same function; so that a single tree will eventually extend so far as to form a complete forest, in which the stems are united by the branches to each other. The prehensile tree in question similarly throws out from its branches long, flexible tendrils, which, touching the ground, do not take root there, but twine around any article that may lie within their reach. After a time these *quasi* branches contract, so that they fail to reach the ground; but the finger-like processes continue to closely grip the article round which they have twined themselves, and which are consequently suspended in mid-air. In this way, articles of considerable weight may be literally picked up from the ground and held in suspension.

No Rats in the Pacific Isles. — *L'Union Médicale* says: "It is a remarkable fact that there are no rats in the islands of the Pacific Ocean. Repeated attempts have been made to acclimatize the rodents there, as the flesh is much esteemed by the natives as an article of food. But the attempts thus far have failed, as they invariably die of consumption." Does this mean (we have not seen the French) that they fall victims to phthisis or that they are "consumed" as food?

A Famous Old Rosebush. — The celebrated rosebush at Hildesheim, in Hanover, believed to be 1000 years old (tradition says it was planted by Charlemagne), never bore so many roses as this season. The shoots grafted on its trunk in recent years are growing admirably. The bush stands at the outer wall of the cathedral crypt. Its branches extend about 38 ft. high, and 34 ft. in width. It is an object of much curiosity.

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, OCTOBER 1, 1882.

THE TELEPHONE.

It is less than half a dozen years since Bell called public attention to the results of some experiments which he had made in transmitting articulate sounds over wires by electrical appliances. We attended some of his first trials in transmitting sounds between Salem and Boston, and in contrast with the remarkable results of the present time they were indeed but miserable failures. His apparatus was rude and clumsy, consisting of a huge box almost large enough for a beehive; and into an orifice in this box he shouted to his associate in Boston until the perspiration streamed from his face, and his voice was lost in hoarseness. But "Mr. Walton" (we think that was his name) could rarely hear the voice at Salem, and the louder the shouts the more painful the silence. At this time the invention was not regarded by the inventor as having any great practical value. It was not his original design to secure it by patents, but to bring the matter to the attention of scientific men, and be content with the applause which follows the discovery of a new principle in science. He was poor, and not known to the scientific world outside a small circle, who knew him as an ingenious and successful teacher of phonetics and an instructor of deaf mutes. We have heard him present views and plans connected with his special department before a private company of gentlemen which were exceedingly interesting, and showed that he was an original thinker and investigator.

It is probable that Bell had not the least suspicion, at the time of his early experiments, that others had entered the path that he was pursuing. He was, unquestionably, an honest and original investigator, however clearly it has been or may be shown that he was but a follower, not a pioneer, in the line of a great discovery.

If no one had come to the front with supplementary devices, Bell's invention would have had but little practical value; it needed the discovery of another new principle in order that what he had brought to light might become of service. The outline principle of the microphone had been known for a considerable time before Edison arranged mechanical devices for exhibiting its wonders; and to this is due the simple device of Blake, which is now used as a transmitter in all the Bell telephone systems. Blake has received large sums of money from the Bell Company for his device, as a royalty is paid on every instrument used. If no contrivance had come to light having like capabilities of increasing the volume of sound, Bell would be under great obligations to Blake; but without doubt the two inventions would have been disclosed almost simultaneously, under any circumstances. So far as mechanical construction goes, they might not have been similar, but in principle they would have been alike.

The telephone has become a widely used practical invention; is it a *necessity?* We say

no, it is not, if that alone is a necessity which cannot be dispensed with. We can do without the telephone in all the business and social relations of life; it does not add to the welfare or happiness of mankind; it does not promote health, increase physical comforts, or further any industries save those involved in the making of telephonic instruments and iron wire. The telegraph has long furnished the world with means of instantaneous communication, and this method ought to be made entirely satisfactory. Telegraphy has become a vast monopoly in the United States, and this in spite of the fact that the invention is open and free to all. Telephony is now a monopoly, and daily becoming more burdensome to those who imagine they need its benefits. There are thousands of people in moderate circumstances who have ordered the telephone wires brought to their dwellings, not that they are needed, but because the telephone is just now *fashionable;* it is the style for fashionable women to talk with butchers, grocers, and bakers "over the wires." It would be much better for housekeepers to secure healthful exercise by walking to the market than to speak languidly through a hole in a box at home when a pound of beefsteak is wanted. The telephone will hold its place for a while longer in dwellings, but patrons will soon become tired of the incessant bell-ringing and useless expense, and the demand will be for their removal.

For business men it has advantages, but it has never been received with universal favor by them. The system is unreliable and annoying in counting-rooms, and many telephones have been removed in the past year or two.

Not every invention which is great and wonderful is indispensable. Inventions which increase expenses of living or doing business, without really being needed, are not beneficent or desirable.

A NEW BOOK.

THE unusual interest manifested, on the part of many readers, in some articles which have appeared in the JOURNAL has led the author to re-write, extend, and publish them in the form of a book. The topics relate to the origin of man, his material and spiritual nature, the event of death, and the life hereafter. The first essay is "The Genesis of Man;" then follow "The Material Man," "The Spiritual Man," "What is Spirit?" "The Religious Man," "What of Death?" "After Death What?" and "Where?" The light which science, revelation, facts in nature, and facts in psychology are capable of affording upon these interesting and momentous themes is here concisely and clearly presented.

The book has nearly 200 pages, and although privately printed for distribution among friends, the demand for copies has been so large that a new edition will be printed for general sale. Those of our readers who desire a copy can have one sent through the mail by sending one dollar to the office of the JOURNAL, with name and address clearly written.

IT is asserted that articles of iron or brass may be bronzed by dipping them into melted sulphur mixed with lamp-black. The surface, after being drained off, will take a beautiful polish, and presents the appearance of oxidized bronze.

THE MICROSCOPISTS AT DINNER.

THE New York *Times* indulges in a little good-natured fun at the prevalent mania for finding the source of all evils in microscopic organisms. It reports an imaginary meeting of microscopists, and the following is an extract from the "proceedings:" —

When the microscopists sat down to dinner each one produced his compound oscillating microscope, and carefully examined every article of food. Excited shouts went up as new discoveries of metallic, vegetable, and sausage substances were discovered in the soup. An examination made of the water resulted in the discovery of such an enormous quantity of infusoria, mammalia, and pachydermata that the microscopists unanimously refused to drink it. During the progress of the meal much enthusiasm was aroused by the announcement of Professor White that he had discovered a trace of hairpin in the beefsteak, thus upsetting the theory that the beefsteak of American hotels is a chemically pure carburet of sole-leather; and, at a later hour, Professor Black's assertion — based on a thorough microscopic examination — that he had discovered whortleberries in the whortleberry pudding, and wine in the wine sauce, led to a heated discussion, in the course of which thirty-eight microscopists declared that Professor Black was an ignorant and unprincipled pretender, and eleven others maintained that the professor was acting in good faith, and that his discoveries could be accounted for on the theory that the waiter had given him, by mistake, a piece of whortleberry pudding made expressly for the landlord's private table.

WHAT IS KALIUM CHLORATUM?

THE advantages claimed for the use of the Latin language is that it is a universal language, generally understood by the learned of all nations, and, that in pharmacy, at least, there is less confusion and less danger of mistake with it than in the use of modern languages. Were it possible to make use of Ciceronian Latin, the first of the claims would be a valid one, but it is just here that it fails. Scientific Latin is a product of modern times, and each day adds new words to its vocabulary, the general construction of which depends on the nation that adds them. We doubt whether many of the best Latin scholars in America can translate the title of our article correctly into English, and we feel confident that some of our best pharmacists would fail to put up the right salt unless they had something beyond the name to guide them. To the chemist it has less meaning than its German equivalent, *chlorkalium*. The fact is that the German, who is very fond of putting Latin names on his chemicals, constructs his Latin according to *his* ideas, we according to ours, and of course these differ. Not so with chemical symbols. It is true, there are two systems of symbols in use, but they are the same everywhere, with such minor exceptions that no confusion or mistake can arise. In the case before us, KCl permits of being changed to KaCl, but even in that form cannot fail of being recognized.

The difference between a chloride and a chlorate is a wide one, and every system of nomenclature takes particular pains to make a corresponding distinction of name. The German is not behind us in this, for potassium chlorate ($KClO_3$) receives in his species of Latin the name *kali chloricum;* but unfortunately his name for the *chloride* more nearly resembles our name for the *chlorate* than the reverse. So in like manner he calls potassium bromide (KBr) *kalium bromatum*. In this case, however, common sense will aid the pharmacist, who knows that bromates are not used in medicine.

If we pass to the sulphates and sulphites we find the case but little clearer. As regards *sulfuratum* and *sulfuricum*, which shall be taken to mean sulphate, which sulphite?

The Germans sometimes sacrifice accuracy to brevity, as in the case of *tartarus natronatus*, for Rochelle salt. Their name fails to show that it contains potash.

We might take up the French codex, and show that a third kind of Latin is in use therein, for example, *chloruretium zincicum*, but we have good prospects of having variety enough in our own land when the unclassical nomenclature of Dr. Oscar Oldberg's "Unofficial Pharmacopœia" is adopted, and added to that now in use. (See JOURNAL for January, 1882.)

Since in most cases there is some resemblance between the English and the Latin name of many well-known drugs, it has been proposed that physicians who write a legible hand should use obsolete alchemistic terms in their prescriptions, to prevent the patient from knowing what he is taking where any prejudice is likely to exist against the drug, as in the case of calomel and quinine. This does not look as if uniformity and clearness were desired.

It is a peculiar fact that, while an English translation of the German pharmacopœia has been published it has never, so far as we are aware, been printed in German. It was proposed to print the next one, now nearly ready, in German, but we learn that the government has forbidden it, and therefore its publication is being delayed until it can be translated into Latin.

H.

METEOROLOGY FOR AUGUST, 1882.

THE sum of my observations on the weather for the past month has been as follows: —

Average Thermometer.		Lowest.	Highest.	Range
At 7 A. M.	64.23°	53°	75°	22°
At 2 P. M.	78.68°	66°	89°	23
At 9 P. M.	67.18°	56°	78°	22°
Whole month	70.01°	53°	89°	36°
Second average[1]	69.29°			
Last 19 Augusts	68.41°	62.79° in 1866.	71.76° in 1872.	8.97°
Second average[1]	67.48°	61.39°	71.11° in 1877.	9.72°
Summer of 1882	69.71°	53°	90°	37°
Second average[1]	69.02°			
Last 19 summers	68.61°	65.60° in 1867.	71.81° in 1876.	6.21°

[1] Found by adding the average evenings *twice*.

The average barometer for the past month was 29.996 inches; the lowest, 29.62, on the 9th, and the highest, 30.23, on the 1st, a range of .61 of an inch. The average for the last ten Augusts has been 29.975, the lowest, 29.868, in 1878, and the highest, 30.010, in 1880, a range of .142. The sum of the daily variations was 2.87 inches, giving an average daily movement of .092 of an inch. The average for the past ten Augusts is .081, with extremes of .053 and .114, in 1876 and 1878. In these years the rainfall was 1.80 and 6.81 inches; illustrating what we should expect, namely, that the greater the atmospheric variations the greater the amount of rain. To this rule, however, there are exceptions.

The face of the sky in 93 observations gave 73 fair, 17 cloudy, 4 overcast, and 2 rainy. The amount of rainfall was only 1.25 of an inch. The average for the last 14 Augusts has been 4.11 inches, the lowest amount, .87, in 1881, the highest, 10.03, in 1872.

The direction of the wind in 93 observations gave an excess of 45 southerly and 57 westerly over the northerly and easterly, indicating approximately the average direction to be west 38° 15′ south, or full W. S. W. For the last 14 Augusts the average direction has been west 26° south. The south-

erly winds have prevailed over the northerly every year except two, namely, in 1869 and 1873; the westerly over the easterly also every year except two, namely, in 1873 and 1875. Two of these excesses, it will be seen, occurred the same year, 1873, when there were ten north and two east, with 7.77 inches of rainfall, the largest amount in August, with one exception, during the 14 years.

The month in general was very warm and also very dry, the temperature being 1.60° above, and the rainfall 2.86 inches below, the average. Rain fell in moderate quantities (.40, .50, and .35 of an inch) on the 8th, 16th, and 24th, an equal distribution, but in connection with such intense heat that the earth became very dry and vegetation suffered greatly; less, however, in this region than in some other parts of New England. Our warmest day was the 8th, with an average of 79.67°; the 19th was the coolest, with an average of only 60°. The first ten days of the month averaged 75.4°; while the first ten in Boston, as reported in the *Daily Advertiser*, averaged only 73.75° (omitting the 5th, not reported), with the warmest (78.8) on the 9th. The same ten days in Natick, compared with those at Boston, stand thus: at Natick at 7 A. M., 69 2°; at 2 P. M., 83.7°; at 9 P. M., 72.0°; average 74 96.° At Boston at 7.23 A. M., 70.2°; at 3.23 P. M., 80.65°; at 11.23 P. M., 70.7°; average 73.85°. The difference 1.0°; 3.05°; 1.3°; 1.11°; showing the mornings to be cooler in the country, while the noons and evenings were cooler in the city, or nearly the reverse of the results by comparison as made last month. The greater abundance of vegetation in the country may account in part for the cooler mornings, and the later hours of observation in the city may account in part for the lower temperature at noon and evening. But why this reverse in the noon comparisons, with only three days intervening between the two periods? In the former the noons in the city were nearly 4° warmer, and in the latter full 3° cooler, than in the country. The greater frequency of easterly winds in the city may account for it in part, and the effect of the continued drought in the country may have had further influence.

The beautiful aurora on the 4th was noticed with special interest. It is doubtless an electrical phenomenon, and it often calls to mind a suggestion offered many years since by that distinguished professor of Harvard University, John Farrar, that the constant revolution of the sun over the torrid zone seems to make the earth itself a great magnet; that vast quantities of electricity or magnetism are driven to the poles of the earth, till these become overcharged; and that the aurora is the result of nature's effort to restore the equilibrium. If, however, this be the true theory, we should expect perhaps greater uniformity in these phenomena; but as the JOURNAL suggests, in its September issue, that the sun spots have something to do with the aurora, they may thus modify that uniformity, so as to secure the variety witnessed. But how all this can be does not yet fully appear.

By referring to the table it will be seen that the entire summer months just past have also been warmer than the average during the past 19 years by 1.10°. On the other hand, the amount of rainfall has been below the average by 1.44 inches, giving us an unusually warm and dry summer. The drought has not been so severe for many years. The springs are very low, and in some regions water has been so scarce as to be sold by the gallon. Referring to this remarkable drought, the *Adams Transcript* says: "The losses to the New England farmers are estimated by the New Hampshire Board of Agriculture at $1,500,000 on the corn crop, and $3,000,000 on farms, gardens, and orchards."

D. W.

NATICK, *September* 8, 1882.

EDITORIAL NOTES.

WEATHER RECORDS. — The very interesting and valuable Meteorological Tables and weather observations which have appeared in the JOURNAL every month for so many years are prepared by Rev. Daniel Wight, of Natick, Mass., a most faithful and intelligent observer. We mention his name (not having obtained his consent) as an act of justice, and to bring to view one who, in modest retirement, has steadily pursued his work with untiring assiduity and great accuracy. It often happens that the results of such labors are needed by parties in court, and for various purposes. We have no doubt Mr. Wight will be pleased to furnish his meteorological records for moderate compensation to any one who may need them.

CHEAP SPONGES. — We have all seen them, says the *New York Mail and Express*. They are for sale on the street in all parts of the city. They are very pretty to look at, so white, and clean, and nice, and withal so wonderfully cheap. The happy purchaser feels that he has made a point on the grasping druggist, who sells the same sized article at fifty cents, and goes on his way rejoicing. One thing is evident on the face of the matter: either the druggist or the five-cent sponge man is a swindler. We give an illustration of the effects of a short-sighted economy. A visitor at the house of a friend, in this city, noticed one day that the three youngest children of the family, and also the nurse, had a peculiar affection of the eyes, which were noticeably swollen and bloodshot. He inquired the cause, but the mother did not know; thought it was a little thing, which would soon pass off. The visitor's curiosity was excited, however, and, being of a logical and investigative turn of mind, he came to the conclusion that the cause of the trouble must be something in the nursery, and probably in the bathing arrangements. Upon looking further he found one of these bleached sponges. He asked the mother where she got it, and the reply was that it was a great bargain, and had been picked up at a five-cent counter. That was enough to explain the whole matter. If you will take the trouble to smell of one of these cheap sponges, you will find that there is about it an odor of chloride of lime. The chloride of lime is used to disinfect them. They need disinfection, because they have been used in hospitals for washing out wounds, and in other ways imaginable, and then thrown away, perhaps, to be picked up, bleached, and sold to economical persons who wish to get a great bargain. More details might be given, but perhaps this short statement of the case is sufficient.

ACCIDENT IN A SULPHUR MINE. — The *Gazette Piémontese* reports a terrible accident in one of the sulphur mines at Caltanisetta, in Sicily. The rope by which a wagon heavily laden with sulphur was being drawn up an incline out of the "Tumminelli" pit suddenly snapped. The wagon thereupon commenced descending again, and, there being no possibility of stopping it, the wagon rushed at a tremendous speed to the bottom of the pit, and was instantly dashed to pieces. Owing to the high friction the brimstone burst into flames, with the most disastrous results to the miners, who were all at work at the time. As soon as the fire was extinguished there were no fewer than thirteen bodies taken out of the pit, the victims having all been suffocated and burned to death. There were, in addition, upwards of thirty miners who had received injuries, chiefly burns of a more or less serious character.

JAPANESE LEGEND OF THE ORIGIN OF ART. — The Japanese have a legend about the origin of art in their country. They say it was born about the commencement of the Christian era, when Nomino Soukune abolished the practice of burying living persons with the dead, and clay images were made to imitate them and sacrificed instead. Later tradition asserts that a party of Chinese immigrants landed in Yokohama, B C. 200, under the pretence of seeking a plant which was a specific against death, and which they believed flourished in Japan; but that, failing to find the flower, they settled in the country and introduced the arts and sciences.

A CHEMICAL COMPARISON. — The doctrines of the Russian Nihilists, German Socialists, and French Communards, says Maxime du Camp, are like spirit of salt, muriatic acid, and hydrochloric acid, one and the same poison, under different labels.

ATOMS.

HORACE GREELEY once emphasized the value of a vegetable diet by the remark that after Nebuchadnezzar had been turned out to grass it was never recorded of him that he suffered from indigestion.

MEASURES have been taken for the construction of an electric railway at Tunis.

A BOTTLE of fifty gallons' capacity, the largest ever blown in this country, was lately made at Millville, N. J.

To remove ink from hektographs, moisten the pad with water acidulated with muriatic acid (10 per cent.), and rinse well.

CANNABIS AMERICANA locally applied is the latest treatment for "reasoning mania." The fibre is the part preferred.

ONIONS, to be deprived of strong odor, should be boiled in salted water for 10 minutes, and then put in cold fresh water for half an hour; after that they should be put into a stewpan with just enough cold fresh water to cover them, and boiled gently till tender. Drain and serve with melted butter.

THE French are, by common consent, the custodians of the standard measures of the world. Our Government standards have been, at several periods, recompared with the French, and the differences noted.

THERE is eminent medical authority for the statement that unripe or very old potatoes contain a certain quantity of solanine. This may produce serious results, if the potatoes are boiled with their skins on, and if they are eaten in large quantities.

SALTING, M. L. Fourment asserts, is not necessarily fatal to trichinæ embedded in meat. These parasites may live in salt provisions for fifteen months. Salting, indeed, often serves to preserve the vitality of trichinæ, as it protects them to some extent from the destructive influence of heat.

MATERIALISTS sometimes quote the words of Kant, "Give me matter, and I will explain the formation of a world;" but they omit his other words, "Give me matter only, and I cannot explain the formation of a caterpillar."

A NEW ALLOY, called "argasoid," has recently been described by Mr. V. Jeuptner, of Vienna. It has been used as a substitute for silver, and its price is said to exceed that of brass by about 50 per cent. Its density is 8.44, and chemical composition as follows: tin, 4.035; lead, 3.544; copper, 55.780; nickel, 13.406; zinc, 23.198; iron, trace.

"ST. JACOB'S OIL," according to Squibb's *Ephemeris*, appears to be a feeble and badly made aconite liniment, and it consists mainly of water, ether, alcohol, turpentine, and a small proportion of aconite with red coloring matter.

RAWHIDE horseshoes are made and used in England, but to no great extent. Three thicknesses of green hide are said to be compressed into a steel mould, and then subjected to a chemical process. It is said one of these shoes weighs but one fourth as much as an iron shoe, and will wear longer.

THE longest span of wire in the world is used for a telegraph in India, over the river Kistnah. It is more than 6000 feet long, and is stretched between two hills, each of which is 1200 feet high.

Medicine and Pharmacy.

THE SANE VERSUS THE INSANE.

The philanthropy of our day is at times in danger of overshooting the mark. In its careful consideration for the unfortunate objects of its benevolence, it may become careless of the rights or claims of the rest of the race. One is reminded of Henri Havard's account of the Dutch S. P. C. A., who secured the passage of a law forbidding the use of dogs in harness; the result being that the canal boats, which had often been drawn by a woman and a big dog working together, were afterwards drawn by the woman alone or a couple of women.

The tender regard of benevolent people for the insane is getting to be carried to such an extent as to compromise the interests of those who have the bad luck to be in their right minds. The *Philadelphia Medical Times* shows up this tendency in an article headed "Protection of the Insane or of the Sane?" The following extracts from it will interest our readers: —

If ever fate should require us to define the nineteenth century in four words, we should note it as The Age of Societies. From Czar-destroying Muscovite to the pious American, the rage for union is triumphant; from red-handed communism to Bible distribution, every possible wish, thought, or hope of the human race seems to have its association. Therefore are we not surprised at the "Proceedings of the National Association for the Protection of the Insane," which has recently been put upon our book-table. Reporters, disguised, forcing their way into insane hospitals in order to make a sensation, and earn their penny a line, lawyers overbrimming in court with philanthropic eloquence concerning the sufferings of some client not too insane or too impecunious to recognize the golden springs that move legal emotion to its centre, learned judges on their benches, newspaper editors in search of a sensation, and doctors eager for notoriety and fees have made such a din that a quiet voice asking for protection of the sane is not to be heard; and, as there is no taint of consulting visits or legal processes upon the breezes that blow from such quarters, we suppose it will not be possible to have a flourishing society to protect the sane against the insane; but assuredly the sane suffer more from the insane than do the insane from the sane.

Sitting in court the other day, we saw an old man with face scarred and furrowed as a tree torn and blasted with lightning: one eye gone, health ruined, a victim of the insane, — of the vitriol-man. Picking up the newspaper this morning, the first paragraph gave account of the murder of a family by their crazed mother. Going into a patient's house, the story was told us of the whole family life ruined by the doings of a member really insane, but not yet quite insane enough for the law to step in, — of a daily martyrdom by worry beyond endurance and constant terror of disgrace.

Is there any of our readers who has not seen, time and again, instances like these? Are not the papers and the courts full of them? The nearest friends of the vitriol-thrower had been warned by physicians that the father was insane. After the throwing the law stepped in; but that did not help the ruined victim. Legislators seem to have thought only of preserving the liberty of the insane, never the lives and hopes of the sane.

We have not written these words in any spirit of opposition to this National Association, but to call attention to the fact that the insane at present probably inflict more injury upon the sane than the sane do upon them, and that such an association should use any influence it may have to secure laws which should benefit both sane and insane. Assuredly, when a person is really insane, and in law not responsible, the law should hold some one responsible that this person is so guarded and watched that the community shall not suffer.

CARLYLE'S DYSPEPSIA.

Dr. O. W. Holmes, in one of his Lowell Institute lectures on English Literature, many years ago, dwelt humorously and shrewdly upon the influence which one's state of health may have upon the tone and temper of his writings. Referring to the morbid character of large portions of Pollok's "Course of Time," he remarked that, if the manuscript had been submitted to him for criticism, he should have turned the leaf and penned a prescription suited to the "symptoms" indicated by the "bilious" composition. The *Medical News*, in a recent article, is disposed to take a similar view of much that Carlyle wrote, as the following paragraph shows: —

Carlyle early began to suffer from indigestion. An insufficient and faulty diet, composed for the most part of oatmeal cake, which, in his poverty, was the only available food, was the chief cause of the derangement. He suffered from acid indigestion and flatulence, a condition in which, as all practical physicians know, the mind is especially prone to be depressed. No thinking person, reading his life, can fail to be deeply impressed with the influence of this dyspepsia on the development of his character and the bent of his genius. He was rendered gloomy, unsocial, taciturn, and intensely irritable. He slept poorly, he could not bear noise, and his thinking faculty required silence and seclusion for its proper action. The gloomy view which he took of the constitution of modern society was a reflex of the mental depression due to bad digestion. His railings and wailings over the degeneracy of the times in which he lived, his hopelessness of any improvement, and his mean opinion of all the literary men and women with whom he came in contact had their origin, and find their true explanation in the same morbid state. How lamentable that a great genius, a philosopher who tried to see into the essence of things, should have all his opinions colored, even made, by a state of flatulence! Conceive, O honest reader, of a great philosopher, flatulent, and mistaking his bewildering fancies, begot of indigestion, for the very truth!

THE HEALTH OF THE TROPICS.

The popular notion that tropical regions are generally unhealthy does not appear to be well founded. The excessive mortality of certain districts is due to other causes than climate, being mainly the result of the unsanitary conditions under which the semi-barbarous natives exist. The *Philadelphia Reporter*, after commenting upon the effects of the late summer heat on health, remarks: —

The highest average temperature in the world is found near the southern extremity of the Red Sea. Yet the medical officers of the English Abyssinian expedition report that the natives of that region are vigorous and long-lived. The virility of the old men was particularly noticeable. It was not at all uncommon for them, when over seventy, to have numerous children. As their wives were strictly secluded, the paternity was indisputable.

Much has been said lately about the unhealthiness of Panama, and the mortality attending the great work of M. de Lesseps there in progress. But these accounts have been vastly exaggerated. We are acquainted with gentlemen who have spent years in Panama, and they consider the climate quite as salubrious to those who become acclimated.

Within the last week we have spoken with a distinguished scientist who has just returned from a scientific mission to Darien and Panama, and he pronounces the reports about the excessive sickness among the canal employees to be false. Most of the workmen are from the neighboring parts of the tropics, and bear the climate well.

As to the asserted inability of natives of the tropics to bear severe labor, it is completely refuted by the history of civilization. The greatest works of man on both continents have been in tropical or subtropical climes. Civilization had its birth in Mesopotamia and Egypt, where the climate is extremely hot, and again in Yucatan and Peru, — the one directly under the equator, the other enjoying a warmth which varies from 70° to 110° in the shade.

It is true that a race long accustomed to the bracing air of a northern winter loses somewhat when it is translated to a land of perpetual summer. Much of this, however, is owing to carrying the habits of the cool into the warm latitudes. When such emigrants adopt the clothing, food, and habits of the land to which they go, they suffer much less.

Two potent reasons why modern races have less energy under great heats are, unquestionably, alcohol and tobacco. Both of these profoundly impair the nerve force, and tend to diminish the resistance of the body to extremes of temperature. One able observer attributes the deterioration of the European natives of the tropics principally to the use of tobacco, and his suggestion has much to support it. It is only since these two agents, and especially tobacco, have been widely used that the vigor of tropical nations has markedly diminished.

TREATMENT OF WHOOPING-COUGH.

Some of the correspondents of the *British Medical Journal* have been reporting their experience in the treatment of whooping-cough, and the results may be briefly summarized as follows: —

Dr. Spencer T. Smyth has pursued the following plan with most marked benefit: At first, the various secretions must be attended to. It may be desirable to administer an emetic of sulphate of zinc, followed by a mild mercurial purge. The diet must be of a light, nutritious character, easy of assimilation: a warm bath should be given to restore a healthy action of the skin; and warm, suitable clothing should be used. Secondly: for a few days only, bromide of potassium, with citrate of potass, ipecacuanha wine, and glycerine, should be given until expectoration becomes free. Thirdly: then give sulphate of quinine in milk every four hours, in doses, according to age, of half a grain and upwards. A belladonna plaster should be applied to the chest and linimentum terebinthinæ aceticum should be freely applied across the epigastric and scapular regions night and morning. Carbolic acid should be inhaled three or four times daily, and the sleeping-room should be thoroughly impregnated with its fumes. During the day the patient should change the room, and, if the weather permit, he should be taken into the open air, being guarded against the cold easterly breezes. In order to complete convalescence he should change his residence for a while. No stimulants of any kind are to be administered.

Dr. Carey Coombs has found most success from inhalation of belladonna and bromide of potassium in spray from Siegel's steam spray-producer. The formula he used was: Ext. bellad. gr. vj.; ammonii bromidi, gr. xx.; potassii bromidi, gr. xl. in aq. ℥j. This lotion was put in the bottle of the spray ap-

paratus, and inhaled by the patient for five or ten minutes, once or twice daily, according to the severity of the case. The pupils should dilate; this will determine the amount of belladonna in the lotion. No other medicine was needed by the patient thus treated.

Mr. C. R. Illingworth has found carbolic acid, applied locally and given internally, to answer admirably. For local application he uses the glycerine of carbolic acid, of the strength 1 in 30, applied daily with a laryngeal brush. Internally, for a child two years old, he prescribes a teaspoonful of the following mixture every four hours: Solut. acidi carbol. (1–20) ℥ss.; tinct. belladonnæ, 3ss.; tinct. camph. co. 3iss.; syrupi rhœados, 3ij.; aquam ad ℥ij. He also recommends that cod-liver oil and wine should be given three or four times a day. He never orders any special diet.

Mr. W. W. Morris has largely used a combination of ether, valerian, artificial musk, and origanum, during the last twenty-five years with uniform success. If taken at the commencement of whooping, the first dose generally cures; or, if a week or two has elapsed, two or three days generally suffice. His druggist supplies them in a nicely-sweetened mixture ready for dispensing. It merely requires diluting with three times as much water.

Mr. C. J. Evans has found the best results from the subjoined prescription, and does not recommend any special form of diet: Potassæ nitratis, gr. v.; vini ipecacuan. minims v.; liquor ammoniæ acetatis, 3ss.; tincturæ belladonnæ, minims iv.; acidi hydrocyanici diluti, minims ii.; aquam ad ℥ss. This is for a child of three years and upwards; one to two tablespoonfuls under that age.

FORCED ALIMENTATION IN PHTHISIS.

This question has latterly attracted considerable attention in France, particularly through the clinical experiments of M. Debove, who has been in the habit of giving to phthisical patients milk and eggs exclusively, but in large quantities.

At a recent séance of the Société Médicale des Hôpitaux, he informed the society that he had recently substituted pulverized meat for the former exclusive alimentation by eggs and milk.

He was led to this practice through consideration of the fact that carnivorous animals are less frequently affected with phthisis than herbivora.

M. Debove makes use of powdered meat prepared as follows: The raw meat is placed under a powerful press, and all the juice squeezed out, and put one side; the dry meat is then placed in a slow oven, and finally reduced to a fine powder, which is carefully sifted. Four pounds of meat give, by this process, somewhat over six ounces of this powder, which may be mixed with or beaten up with eggs, for use in alimentation.

Relatively, considerable proportions of meat thus prepared may be taken on weak stomachs. M. Debove habitually administered, per diem, half a pound of this powder with twelve eggs and a quantity of lentil flour. Phthisical patients thus nourished regain flesh rapidly, and at the autopsy of one of them, who died through accident, it was found that there was a commencement of cicatrization in some of the cavities.

M Dujardin-Beaumetz confirmed the results obtained by M. Debove's method, and stated that he had also found it of inestimable service in two cases of incoercible nervous vomiting.

MISCELLANEA MEDICA.

Aphorisms on Treatment of Diseases of the Eye. — Dr. Chisolm, chairman of the Section of Ophthalmology, at the recent annual meeting of the Medical and Chirurgical Faculty of Maryland, lays down these aphorisms: (1.) Do not blister; in nine cases out of ten it is useless torture. (2.) Do not use nitrate of silver; in not one case out of fifty is it beneficial as generally prescribed. (3.) Do not use acetate of lead, for fear of leaving lead marks on the cornea. (4.) Weak astringents are the best remedies for affections of the mucous surface, combined with absolute cleanliness. (5.) Use weak solutions of eserine for corneal affections. (6.) Atropic solutions are essential for breaking up recent iritic adhesions. (7.) When in doubt call in a specialist. Eserine, he observes, is beginning to play a very conspicuous part in a great number of eye diseases, supplanting atropia to a great extent. The strength of its solution is one part in 200 of water. A drop of this in the eye on rising will, in photophobia and commencing presbyopia, sharpen the eye for vision for reading during the day. It is efficacious in all cases of increased tension of the eye, of which glaucoma is the type. In all corneal affections eserine has taken the place of all other remedies.

Anti-Diphtheritic Inhalation. — Some years ago Dr. H. Hager recommended a mixture composed of

Carbolic acid	10 parts,
Alcohol	10 "
Water of ammonia	12 "
Distilled water	20 "

as an excellent inhalation in catarrhal affections. It was directed to be used thus: A small wide-mouthed bottle was to be filled one third with the liquid; then a sufficient quantity of cotton was to be introduced to just soak up all the liquid. The bottle was then to be well stopped. In coryza, incipient catarrh, or similar affections, the inhalation through the nostrils of some of the vapor of the compound was found to be of the greatest benefit.

The same author now recommends a still stronger compound, to be made from

Carbolic acid	10 parts.
Oil of turpentine (or oil of Eucalyptus)	5 "
Water of ammonia	12 "
Alcohol	20 "

A small quantity of this is to be dropped into a small wide-mouthed bottle half filled with cotton or asbestos, and the bottle well stopped. After a few days, a little more may be added, until a strong odor is given off, when the bottle is opened.

A physician to whom Dr. Hager recommended the use of the compound thinks that it prevents the spread of diphtheria, since, in five families, in each of which one case of diphtheria had become developed, its further spread was arrested, apparently through the use of the antiseptic inhalation. In another family, a second child was taken with the disease; but the child could not be coaxed to inhale the vapor. The inhalations should be as full and deep as possible. In some cases of coryza, it has been used with most excellent effects.

Should the odor of oil of turpentine be too offensive to any person, oil of Eucalyptus may be substituted for it.

Therapeutic Uses of Tobacco. — Dr. G. M. Christine urges the more extended use of tobacco in the form of poultices. Dr. Christine considers it very efficacious in relieving pain, when poultices of mush or flaxseed are of no avail. To make the poultice the leaves are the best, but cigar clippings will answer. The tobacco should be cut up fine, and mixed with flaxseed meal. The poultice is then made in the usual manner, a piece of linen or gauze being placed between it and the body. Care must be taken, of course, that the part of the body to which the poultice is to be applied be not denuded of cuticle.

Mr. Beecher as a Surgeon. — In a sermon delivered recently, Mr. Beecher said that, while he was not a surgeon, he felt sure that he could cut a man's leg off if necessary, for he knew how to tie up an artery and draw the flaps over. Blessed were the men who had a little of everything in them.

Iodide of Potassium in Frontal Headache. — Dr. Haley states in the *Australian Medical Journal*, that for some years past he has found minimum doses of iodide of potassium of great service in frontal headache. A heavy, dull headache, situated over the brow, and accompanied by languor, chilliness, and a feeling of general discomfort, with distaste for food, which sometimes approaches to nausea, can be completely removed by a two-grain dose dissolved in half a wineglass of water, and this quietly sipped, the whole quantity being taken in about ten minutes. In many cases the effect of these small doses has been simply wonderful. A person who, a quarter of an hour before, was feeling most miserable, and refused all food, wishing only for quietness, would now take a good meal and resume his wonted cheerfulness. The rapidity with which the iodide acts in these cases constitutes its great advantage.

The Possible Value of New Remedies. — Mr. A. J. Bernays, in an address to the students at St. Thomas's Hospital, London, remarks: Students of medicine should be the last people to suggest "*Cui bono?*" in the application of new remedies. Well do I remember one of our former students, who was preparing for the First M. B. of the University of London: he had been much exercised by the various actions of chlorine upon alcohol, and had found no satisfaction in the production of chloral. What is the use of it? The day following he informed me of the discovery by Professor Liebreich of the application of chloral hydrate, and brought me a specimen, which still graces our museum, promising also that he would never again ask what was the use of knowledge.

Sulphide of Calcium as an Antisuppurative. — Dr. Andrew H. Smith, chairman of the Committee on Restoratives of the Therapeutical Society of New York, furnishes to the *New York Medical Journal* for June a report of the committee on the use of sulphide of calcium for the purpose of preventing or diminishing suppuration. After giving the experience of several members of the society, Dr. Smith concludes his report as follows: Judging from this limited number of cases, it would seem that we are warranted in concluding that in many cases of suppurative affections, ranging from the small pustules of acne to extensive suppurating surfaces, an appreciable, and often a very marked, benefit is derived from the use of the calcium sulphide; suppuration which would otherwise take place being averted, or the quantity and duration of an existing discharge being lessened. At the same time its action is not uniform; and in many apparently favorable cases it will fail entirely. The drug is somewhat prone to irritate the stomach, and this circumstance affords an indication for small doses frequently repeated, instead of larger ones at longer intervals. One tenth of a grain every two hours in acute cases will generally secure the full therapeutical action of the drug, but larger doses may sometimes be required, and some patients will bear well a grain three or four times a day. Even in small doses the sulphide will occasionally produce headache, and the patient is usually more or less annoyed by eructation of sulphuretted hydrogen.

The Health of Rome. — English residents of Rome declare that the health of that city during the winter of 1881 was excellent, and further say that, with proper care, Rome now equals in healthfulness any city in the world. The deaths of English Protestants during the winter were 16, and of these the ages of seven were, respectively, 97, 85, 83, 76, 75, 68, and 68 years. Two were due to diphtheria, two to typhoid fever, and the rest to apoplexy, cancer, congestion of the brain, disease of the heart, consumption, and pneumonia.

A WARNING TO ARSENIC EATERS. — The ultimate effects of a *régime* in which small doses of arsenic are given from time to time are in striking contrast with the earlier ones. According to MM. de Poncy and Livon, cats so treated seem improved at first; they eat more, and fatten, and have all the signs of very good health. But by and by they begin to grow lean, are subject to diarrhœa, lose appetite, and seem languid; and at length they die in a state of poverty of blood (anæmia) and leanness. On examination, one finds the muscles (the heart included) extremely pale; the liver, lungs, kidneys, and mesenteric ganglions all have the characters of fatty degeneration.

SELECT FORMULÆ.

HARDY'S OINTMENT. — This ointment, used in France to prevent falling off of the hair, is given as follows by Bourchardat: —

Beef fat	17 drachms.
Castor oil	6 "
Gallic acid	30 grains.
Vanilline	q. s. to flavor.

LAXATIVE FRUIT LOZENGES. — The following is a good formula: —

	Parts.
Aqueous extract of senna (first deprived of its resin)	40
Pulp of purging cassia	20
Pulp of tamarinds	5
Spanish extract licorice	4
Resin scammony	4
Sugar (and tartaric acid)	49

made into large oval lozenges of 82 grains each which are dipped in melted chocolate, and afterwards covered with a crystalline coat of pure cane sugar.

AROMATIC SYRUP OF GALLS.—This is spoken of in Reynolds's "System of Medicine" as highly recommended by Dr. Meigs for the treatment of cholera infantum. The mode of preparation is as follows: —

Gallæ	8 parts.
Cinnamomi	4 "
Zingiberis	1 part.
Spir. vini gallici	125 parts.

Mix, and let the ingredients stand for two hours in a warm place, and then burn off the brandy, holding some lumps of sugar in the flames. Filter. Dose, 12 to 40 drops every three hours.

HAIR TONIC. — The following is commended as safe and efficient: —

Glycerine	4 ounces.
Alcohol	2 "
Water of ammonia	2 "
Tincture of cantharides	2 drachms.
Rose water	4 ounces.
Water	4 "
Grain musk	1 grain.

Mix. When using the preparation, no other dressing or pomade should be applied.

TANNIN AND ALBUMEN. — The *France Médicale* proposes the following as an improved mode of administering tannin: —

Tannin	½ drachm.
Water	3 ounces.
Egg albumen	3 "

When the albumen is added, the mixture is to be vigorously shaken.

ALGERIAN CORN CURE. — Dr. Barbier speaks highly of the subjoined: —

Acetic acid	1 ounce.
Iodine	37 grains.
Alcohol	1 ounce.

Dissolve the iodine in the alcohol and add the acetic acid. A few drops of the liquid are to be rubbed on the corn morning and evening, so as to gradually dissolve it.

We published some time ago a corn remedy which had been recommended by a Russian, M. Gezow. Dr. Traill Green, writing in the *Medical and Surgical Reporter*, expresses the utmost satisfaction with this formula, which he has used in numerous cases of both hard and soft corns with unvarying success. The formula is as follows: —

Salicylic acid	30 parts, or grs. xxx.
Ext. cannabis indica	5 parts, or grs. v.
Collodion	240 parts, or f. ʒss.

A STIMULATING EXPECTORANT. — Dr. Fothergill commends the following: —

Am. carbonat.	gr. v.
Tinct. nux vom.	m. x.
Tinct. scillæ	ʒss.
Inf. serpentar.	ʒi.

Sig. Three times daily.

FACETIÆ.

PHARMACY AND "MALARIA." — At a recent banquet of the Illinois Pharmaceutical Association, Mr. E. S. Baldwin, an editor, responding to the toast of "The Press," and referring to old times, said: "It did not then take a student two years at a pharmaceutical college to learn that when he could not read what the doctor had written he should put in aqua pura, syrup simplex, and podophyllin. No, sir; this blessed system was not invented then. . . . When we remember what our ancestors suffered on our behalf we no longer wonder that they had rugged constitutions, or that we have been permitted to enjoy the effect of their tonics in the shape of hereditary dyspepsia. . . . On entering a modern drug store, you walk boldly up to the be-moustached and be-jeweled clerk. If you know your business, and it is a temperance town, you wink at the fellow, and say something about malaria. It is a matter of indifference just what you say. The single word 'malaria' is the golden open sesame. . . . Whenever I see a man coming out of a drug store, and wiping his mouth on the back of his hand, I realize to its full and awful extent the hold that malaria has on this unfortunate people. What the drug stores in towns where a strict license law prevails would do without 'malaria' is a hard problem."

DRUG-STORE PROFITS. — The *Globe* is responsible for the following: An out-of-town druggist entered one of Boston's apothecary stores, and handed a clerk a simple recipe. "One dollar and fifty cents," said the latter, as he handed the medicine over. "Is n't that pretty steep?" asked the customer; adding, "I'm in the business myself, and know somewhat about the cost of these ingredients." "Oh! that alters the case," was the response; "seventeen cents, please."

REGARDING A COLD IN THE HEAD. — The French have a saying, "All that physicians have been able to do as yet for a cold in the head is — to call it *coryza*." The following conversation summarizes also some very prevalent modes of treatment: —

"What do you do for a cold in the head?"

"I treat it — with contempt. And you?"

"I? When I have a cold in the head — I sneeze."

SILKWORMS AND TAPEWORMS. — An Irishwoman, needing some silk and some tape, sent her husband for them. The silk was shown, but the buyer thought the price too great. The clerk explained that all silk goods were dear, owing to some disease at this time prevalent among the silkworms. The tape was next examined, and the Irishman thought that a little stiff as to price. "And indade, sir," says he, "is there likewise a dezase a-prevailin' among the tapeworms?"

A PATTERN PATIENT. — A physician, much attached to his profession and his own skill, during his attendance on a man of letters, observing that the patient was very punctual in taking all his medicines and following his rules, exclaimed in the pride of his heart, "Ah, my dear sir, now you deserve to be ill!"

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Special Notices.

The Institute Fair.

THE second annual exhibition of the New England Manufacturers' and Mechanics' Institute opened in this city last month and is one of the most interesting and instructive of any that have ever been held. The industrial department is especially complete, and the tobacco firms of the South have some of the finest displays of raw and manufactured tobacco ever put on exhibition.

GOOD WORDS FOR ADVERTISERS.

HORSFORD'S ACID PHOSPHATE IN INSOMNIA.

UTICA, N. Y., *Jan.* 13, 1881

I have used Horsford's Acid Phosphate in a number of cases of nervous debility with good results. Partial Insomnia was a prominent symptom in some. It invariably stimulated appetite and relieved the Insomnia. I think it a meritorious agent in these cases. C. P. RUSSELL, M. D.

FOR SALE. — A Physician's practice, small drug store, horse buggies, library, and furniture, in a growing village of 600, near Chicago. Only drug store or regular physician in the place. Will sell or lease building. Chattels only $1500. Address letter DOCTOR, 54 Lake Street, Chicago, Ill.

WE would call the attention of our readers to the advertisement of CANADA ASHES in another column. It will soon be time to prepare artificial fertilizers for use next spring, and pot-ashes make a valuable addition to fertilizers of any kind.

MR. CURT W. MEYER has recently removed to No. 11 Dey Street, New York, and those wishing electrical or philosophical apparatus of any kind will find it to their advantage to call upon him or send for a circular.

ST. LOUIS, *Aug.* 25, 1881

THE concentrated extract of PINUS CANADENSIS has established for itself the most unqualified commendation as an astringent, and it scarcely requires any further affirmation on my part.

LOUIS BAUER, M. D., M. R. C. S. Eng.
Professor of Surgery in and Dean of College of Physicians and Surgeons, St. Louis, Mo.

LOUISVILLE, KY

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Familiar Science.

THE COMING TRANSIT OF VENUS.

BY PROF. C. A. YOUNG.

THE planet Venus, which all the summer has been conspicuous in the evening sky, reached her greatest distance from the sun upon the 26th of September, and, returning upon her course, is now fast approaching the sun again. On the 6th of December she will pass across the southern portion of the solar disc as a small black spot, easily visible to the naked eye. The transit, as it is called, will begin in the neighborhood of Boston at about nine o'clock, and will end about half past three.

The interest of the event lies not very much in the phenomena presented, but mainly in the fact that transits of Venus are exceedingly rare, and that until recently they were supposed to furnish the most accurate data for determining the distance of the sun. The only transits thus far observed occurred in 1639, in 1761 and 1769, and a few years ago, in 1874. The two next transits, after that of next December, will not take place until the years 2005 and 2013.

It is obvious, of course, that when Venus is between the earth and sun she will look like a black dot upon the sun, and, moreover, that observers at different stations on the earth will see this dot in slightly different positions on the disc. Now, without going into details or explanations as to the why and how, it is enough for our present purpose to say that if observers at widely separated stations of known geographical position will furnish accurate data which determine the precise places on the solar disc occupied by the planet at some definite instant, then we can also compute easily the parallax and distance of the sun. But — and here is trouble — if the data are not extremely accurate, our final result will be widely incorrect. Its value all turns upon the degree of accuracy attainable in the observations.

The observational data may be of three kinds: they may consist of observations of the precise moment at which the disc of the planet touches the disc of the sun, — "contacts," technically so called; or of measurements, made during the transit (with a heliometer), of the distance between the planet and the sun's disc; or, finally, of photographic pictures taken at known instants. These pictures are "measured up" afterwards, and show autographically, so to speak, where the planet was each moment.

When Halley, about 1680, secured the attention of astronomers to the value of these transits, he supposed, and so did every one, that the moment of contact could be observed with an error not to exceed a second or two. Were this so, the observations of a single transit, by a reasonable number of observers, ought to have settled the parallax of the sun within one one thousandth of its value, and determined its distance within 100,000 miles.

In fact, however, it appears that from the whole body of contact observations made in 1761 and 1769, more than a hundred in number, nothing further can be certainly concluded than that the sun's parallax lies somewhere between 8.6″ and 8.9″; its distance between 95 and 92 millions of miles. It was hoped that a century of improvement in telescopes would have made this sort of observation more accurate by this time. But the gain, though real, has been comparatively small. From the contact observations of the English parties in 1874 the most eminent calculators deduce results ranging from 8.76″ to 8.88″, and the difference means a million and a quarter miles in the sun's distance.

The discrepancies are due to slight differences of interpretation put by the computers upon the language used by the observers in describing what they saw; the question being which one precisely of the different phases of the phenomena was really that of the true contact.

The atmosphere of the planet, the so-called "diffraction," and the optical imperfections of the telescope and eye all conspire to produce uncertainty. The writer himself observed the transit of 1874, and most vividly remembers how gradual, elusive, and perplexing were the phenomena, which endured for at least a minute at each internal contact, and made it quite impossible to fix upon any single second as the true one. While this is true, however, it may perhaps still be possible for practised observers, with similar telescopes, to come to some reasonably close agreement as to the instants of certain phases in the slow progress of the event.

The method of heliometric measures was employed by the German parties in 1874; but no results of their work have yet been published, so that it is hitherto impossible to compare its accuracy with that of the other methods.

Photography was pretty thoroughly tried at the last transit by nearly all the parties, and in several different ways. The English and Germans used telescopes mounted in the ordinary way, while the French and Americans used long stationary horizontal telescopes, and directed the light through the lens by means of a mirror. So far as can be judged at present, however, these photographic operations were mostly unsuccessful. The pictures were not found to permit of sufficiently accurate measurement to be of any use, and the commission of European astronomers which sat in Paris last spring to discuss the observation of the coming transit did not recommend any further use of photography.

The American photographs, however, turned out better, as did those taken by one of the Russian parties (at Port Possiet); indeed, to say the least, their results seem to be quite as much to be depended on as those of the contact observations. In this state of the case the American astronomers have felt that, all things considered, the photographic apparatus which was prepared for the transit of 1874 should be used again, and a fresh and most careful attempt should be made to "run the thing for all it is worth," as a college boy would say. Near the close of the last session of Congress an appropriation of $75,000 was accordingly made for the transit, and eight parties are to be put into the field, — four in the Southern hemisphere, and four in the United States. Professor Newcomb's party goes to the Cape of Good Hope, Professor Boss to Santiago, Chili, Lieutenant Very to Santa Cruz, Patagonia, and Assistant Smith, of the Coast and Geodetic Survey, to New Zealand. In the United States, Assistant Davidson will observe at Fort Thorn, New Mexico; and the Naval Observatory professors (Hall, Harkness, and Eastman) will observe respectively at San Antonio, (Texas), Washington, and Cedar Keys (Florida).

The different observatories throughout the country will also coöperate as far as their means will allow. Princeton will photograph the transit with an apparatus precisely similar to that of the Government parties, and perhaps Harvard may do the same. Yale will use her new heliometer (the only one in the country) to make observations on the German plan. All possessors of telescopes will of course observe the contacts, and on the day of the transit Washington time will be telegraphed to every observer who desires it. A few foreign parties will observe in the United States, especially two German parties, — one at Aiken, S. C., the other at Hartford, Ct. For the most part, however, the European astronomers go to the Southern hemisphere, leaving "America for the Americans."

It is not to be disguised that at present it looks as if more accurate determinations of the solar parallax are to be got by other means than by transit observations; as if this old method would prove to be inferior to newer ones, and must finally be superseded. At the same time, this is not quite certain yet; and although some of the leading astronomers have been rather disposed to give the event the "go by," still the prevailing sentiment has been overwhelmingly in favor of making all that is possible out of an opportunity which will not recur for more than a hundred years.

MAN IN THE LIGHT OF GEOLOGY.

THIS is the theme of one of the most interesting of Dr. Winchell's popular lectures at Cottage City; and the following abstract, like those already published in the JOURNAL, has been revised by the author:—

Now that the history of the world has been so far completed, and man has come into possession of its surface, we are able to glance back over the events, and note how their tenor stands related to the final consummation reached in the advent of the human being. The first thought which strikes us is that *man is the fulfillment of the prophecies of the ages.* The first step of progress pointed toward man as the end of that progress. The first animal form which appeared was structureless and gelatinous, though it had the power to build a strong dome above it for protection from the accidents of a stormy sea.

But the next known appearance of animal life was at the bottom of the Silurian; and here was a marked advance along the line of improvement which was to lead up to man. In the later ages came types higher and higher in succession, but all showing a nearer approach to the human consummation. The special history of vertebrates illustrates the thought more strikingly. Here the humble fish of the Devonian age, uncouth and grotesque as it was, gave clear expression to the vertebrate plan of animal structure, which, in the distant sequel, was to flower into the human form. When at length the condition of the world fitted it for the reception of air-breathers, the amphibian and then the reptile was built on the same fundamental plan as the fish. When the reign of mammals came, the predecessors of the horse, ox, elephant, and dog exhibited only other modifications of the same plan. Even the bird's wing has the same framework as the fish's fin, and the bird may be said, structurally as well as functionally, to swim through the air.

So man, at the end of this long and marvellous succession of modifications, is unable to boast of a framework devised for his peculiar use, since it is only borrowed from the mammal, the reptile, and the fish. In some respects it is even less specialized than the skeletons of most mammals. The human foot, for instance, is a modification which characterized the mammals of the early tertiary age. Man now walks, as they did, on the whole length of the foot, while the dog, the horse, and other mammals step only on their toes. The bear, the badger, the kangaroo, and only a few other animals retain the archaic and almost obsolete modification of the foot seen in man. But it must be said that the plantigrade foot has been perpetuated in man, because best suited to serve him in his destined state of higher perfection.

For exactly the same reason the digitigrade foot was developed in the animals whose higher condition demanded fleetness and dexterity, under the various conditions of animal life. Man's advent was prophesied also in mineral arrangements, which sustain no relations to any other being than man. When the beds of coal were laid down it was not for the use of the reptiles or mammals which followed. These wandered over the repositories of mineral fuel unconscious of the resources of civilization which lay beneath. These bore no relation to intelligent but incorporeal beings, for they felt no need of material supplies. Man only was the correlation of these stores of coal and metals and petroleum, with which the rocky crust of earth was stocked in the remote ages, before yet man existed, — when man as yet was only a thought.

The next thought which strikes us is that *the birthplace of man was prophesied* by the events of geological history. America to-day is the home of great herbivorous quadrupeds. South America is characterized by edentates; Australia, by marsupials; while the Oriental continent is the home of the great *carnivores.* These four continents are thus graduated by the rank of the mammalian faunas which inhabit them. The Orient is highest. Now this graduation already existed in the ages before the present. The Orient was long the home of the highest mammals existing. Now that we know that the succession of life was to terminate in man, we discover that the existence in past ages of the pinnacle of life in the Orient was a clear prophecy that the final culmination in man would be in the Orient.

In the next place, we discover indications that man is to be contemplated as *the final term of the organic series.* This is indicated, as Agassiz used to teach, by the vertical position of the spinal axis in man. Beginning in the fish, with a horizontal attitude, the anterior extremity gradually rose as the succession of higher forms passed by, until now the erect attitude is for the first time natural and easy. No further progress of the kind is possible. Again, man is a cosmopolite. No creature before man could range over all the earth. The earliest animals had the widest range. The mammals immediately preceding the human advent had the most restricted range of all. It was to be expected that man's geographical range would be narrower than that of any of his predecessors. But lo, he is allowed to break over all bounds. He spreads into all climes and all lands. He holds continent, river, and sea. He spurns the law of limitation which controlled all his predecessors, and asserts his emancipation from all restraints. This unexpected and striking fact means something. It seems to signalize the final term of the succession. It makes him the recipient of universal empire. It includes all competitors and all successors. The very superiority of man in cerebral endowment and psychic powers reveals a chasm between him and his nearest inferiors, which seems to proclaim that nature, in forming man, had been actuated by a new impulse, had acted with a changed conception, and was conscious of attaining the completion of her work.

Man's advent is a recent geological event. Man, also, in his earliest European advent, was the equal of modern man. Nor do we find anywhere any links graduating from man toward the rank of the brutes. The apes have a genealogical tree; we trace them back to the beginning of tertiary time. Man has no genealogical tree. He stands apart, as if he had been the product of an independent origination. However this may be, he is most closely related in plan of organization to the other members of the animal kingdom. The facts, in short, are such that we may, with Wallace, hold to the evolution of other animals, and yet not embrace the doctrine of the evolution of man.

Man's history is bound up with the history of the world. Its inorganic elements have yielded him the substances of which his body has been built. The surroundings of man have always conditioned his happiness, his prosperity, and even his existence. More intimately are man's organism and history bound up with the history of the organic world. His blood seems to have come through the veins of a long succession of brute progenitors. To say the least, he is held by an ideal bond of common structure to the most intimate kinship with the unreasoning creatures.

We detect in him the indications of a psychic nature. We have often spoken of plans in nature. They are real. Plan is the expression of mind. A coördination implies mind. There is *a mind*, therefore, which presides over the structure and the history of nature. Man comprehends some of these plans. He thinks again the thoughts which have existed in the creative mind. He must possess, then, something of the intellectual nature of the Supreme Being revealed in the method of the world. He is more than matter, — he is a living soul.

ABOUT THE DIAMOND.

THE diamond, as every reader knows, is nothing but crystallized carbon; but how has it been formed? We cannot make carbon take this crystalline form, and how it can have been brought about in nature is one of the most perplexing of scientific enigmas. Mr. A. B. Griffiths, in a communication to the London *Chemical News*, suggests the following as a solution of the "conundrum:" —

We know that the diamond has been found in a fine-grained sandstone in Brazil, and is principally found in an alluvial matrix of sandstone and quartz pebbles. Knowing these facts, and that there are only three methods by which crystals are formed, — namely, by fusion, by solution, and by sublimation, — and as the diamond has been found in sedimentary rocks, and in an alluvial matrix of sandstone and pebbles; and knowing that sandstone and pebbles are produced by the action of water, — hence their name of aqueous rocks, — and as aqueous or sedimentary strata are often fossiliferous, we may draw an inference that the carbonaceous matter of the fossils (plants and animal remains) has been dissolved by highly-heated water, aided by great pressure existing in the crust of the earth. It is a well-known fact that highly-heated water, aided by pressure, can dissolve silica, as in the geysers of Iceland, etc., where it is deposited around the mouth of the vent forming "the sinter;" and also we have the experimental researches of De Senarmont, and others, on the artificial production of crystallized minerals, as quartz, mispickel, corundum, heavy-spar, etc., by the prolonged action of water at high temperatures and pressures; and I think we can see no reason why highly-heated water or water-gas should not have the power of dissolving the carbonaceous matter of fossiliferous plants and animals, and then, on cooling, depositing the carbon in the crystallized condition, forming the gem known as the diamond. As to whether the diamond was formed by sublimation, we can draw no inferences from facts or from nature, so must put this method of forming crystals on one side, as not being able to solve the problem; and further, the diamond cannot be formed by fusion, because we know that crystallized carbon, in the form of graphite, is formed by fusion. Therefore, it appears from these views on the subject that the diamond has been formed in nature by the solvent action of highly-heated water or water-gas, aided by enormous pressure on the carbonaceous matter of fossils contained in sedimentary rocks, followed by slow cooling.

A correspondent asks how doubtful diamonds may be tested without injury. Hydrofluoric acid will not affect the diamond, while it quickly corrodes glass, which is the material of most of the imitation gems. The only objection to its use is that it will attack certain stones of minor [illegible]

real value, like the topaz, which are sometimes passed off as diamonds. Of course, being a dangerous agent to experiment with, it must be employed with great caution. The following directions from the *Manufacturer and Builder* may be safely followed: —

Take a leaden vessel, of saucer shape and moderate size, in which place some powdered fluorspar, which cover with enough oil of vitriol to completely moisten the powder. Then put in the stone to be tested, and gently warm the mixture over a gas lamp or any other convenient source of heat. This should be done in a good draft, where the vapors will be drawn up a chimney or dissipated, as they are dangerous to breathe. When the evolution of vapors appears to have ceased, which will occur in from five minutes to a quarter of an hour, according to the quantity of material employed, the heat should be withdrawn and the vessel allowed to cool. The stone may now be fished out from the pasty mass and examined. If it shows no signs of being attacked, you may be assured that it is a genuine stone. A paste stone will be found to be strongly corroded by the hydrofluoric acid that has come in contact with it; and if a small one, it will probably have been entirely dissolved.

THE STEAMSHIP AND THE OCEAN.

In one of Rev. Francis Tiffany's essays, recently published, there is a fine word-picture of the battle of a steamship with the waves, which is worth quoting for its own sake, aside from the moral lesson he draws from it: —

Every outlook on the world that permits it to mass the entire army of its perils, diseases, wrongs, and sorrows, and to bring them to bear all at once on the imagination, is sure to entail panic and defeat. Such an outlook is as false as the visions of a nightmare. It is with the will of man in the great battle of life as it is with an Atlantic steamship in her battle with the ocean. Grand an embodiment of power as is the steamship, still what is she to the elemental forces of the ocean she defies? No more than the first faint sigh of an infant to a tropical hurricane; no more than the trembling of a leaf to the shock of an earthquake. Think of the Atlantic or the Pacific at its year-long work, battering down cliffs of trap or granite, grinding vast rock masses to finest sand, rolling up enormous bars to dam in an Amazon or a Ganges. Can the little steamer throw down her gauntlet to this titanic continent-leveller? Can her petty thousand horse-power think to take issue with this pandemonium of dragon and demon power? No! not for a moment. She will never be called upon to do it. Napoleon-like, she needs only to hold fast the grand maxim of the whole art of war, and to be the stronger of the two at the actual point of attack. True, the ocean is mighty, but then it is vast and outspread. True, the power of gales is terrific, but then they are howling all abroad over the whole surface of the deep; not a tithe, not a millionth part, of their combined might can be brought to bear on a single point. Look now at the steamship. She is all at hand upon the spot, — "a fiery mass of living valor." Let the battering-ram of the waves do its worst; she is a battering-ram too, that can strike still heavier blows. The particles of the waves do not cohere, but hers do with iron tenacity. The waves are brutal and awkward in the blows they strike; she, in her very build, is like the hand of a skilful boxer, parrying the strokes of a giant clown. Then peer into the white hot heart of her furnaces, and see how she is aglow to the care with passion. Feel sympathetically the titan heave of the steam as it shoulders round the enormous shafts. Ton for ton, blow for blow, the steamship is the heavier mass, the fiercer momentum at the point of attack, and so she wins the day.

SCIENTIFIC BREVITIES.

Zinc in Bronze. — The Society of Architects of Berlin have been investigating the causes which make some kinds of bronze become black. The fact has been remarked that a statue in Berlin, called "Old Frederic," had become covered with a darkish layer, whilst an old cannon before the arsenal had retained its fine green color, the two having been exposed to the same atmospheric actions. Upon being analyzed, the bronze of the cannon was found to consist of nine parts copper and one part tin. The bronze of the statue contains a good percentage of zinc, and to zinc the change of color is ascribed. In order to ascertain if this was really the case, several copper alloys were subjected to the action of a copper solution. The alloys of tin and copper alone took the green color, whilst the alloys containing zinc became more or less black, according to the quantity of zinc they contained.

We may add that, from analyses made by Reyer, it seems that the bronzes used for weapons by the ancients contained no lead or zinc, but were alloys of copper and tin with small quantities of nickel, iron, phosphorus, and occasionally cobalt.

A New Hygrometer. — In a recent note to the Paris Academy, M. Crova has described an instrument for measuring the moisture of the air not subject to the uncertainty characterizing the indications of previous instruments when the air is agitated. The observer looks through a tube towards a source of light. This tube is of nickel-plated brass, highly polished within, closed at the further end with ground glass and at the nearer with a lens. The ground-glass plate appears as a luminous disc, and the polished interior, by its reflected light, has the aspect of a bright annular space round the disc. The air whose moisture is to be ascertained passes slowly along the tube, entering and leaving by tubulures at the ends connected with a suction arrangement. To cool the tube, it is surrounded by a metallic sleeve filled with sulphide of carbon, through which an air current is passed. A thermometer is inserted in this liquid. When the temperature of the air under examination reaches saturation, dew is deposited, appearing like dark brown spots, which contrast strongly with the bright disc when seen directly. A gradual rise of temperature makes these disappear, and thus, by repeated appearances and disappearances, the dew-point may be estimated with an approximation of one tenth of a degree.

Natural History and "Education." — The following story is narrated by a correspondent in the *Students' Journal:* An English physician had recommended a patient to take plenty of horseback exercise, so the gentleman went to a dealer's and looked at a horse, with the intention of purchasing it. He came back to the doctor with the following report. "I went," he said, "to the horse-dealer's, and saw a horse. He looked a very nice, steady animal, and I was going to buy him; but remembering it was a proper thing to look into a horse's mouth, — but why I could not recollect, — I put on my spectacles and examined his mouth. I was then delighted that I had not completed the purchase, for I found the poor suffering creature had lost nearly all his teeth; the only ones left that I could see being six on the top and six in the bottom jaw, and then came two great gaps without any teeth at all. I told the horse-dealer it was cruel to keep a poor animal like that, without any teeth. The dealer assured me the animal had several more teeth in his jaws farther back, and I might put my hand in and try, if I liked. I indignantly refused, however, to be taken in in this manner." Evidently in some "educated circles" the advance in natural history is quite astonishing.

Restoring Faded Ink. — A valuable discovery has been recently made, whereby the faded ink on old parchments may be so restored as to render the writing perfectly legible. The process consists in moistening the paper with water, and then passing over the lines in writing a brush which has been dipped in a solution of sulphide of ammonia. The writing will immediately appear quite dark in color, and this color, in the case of parchment, it will preserve. Records which were treated in this way in the Germanic Museum in Nuremberg ten year ago are still in the same condition as immediately after the application of the process. On paper, however, the color gradually fades again; but it may be restored at pleasure by the application of the sulphide. The explanation of the action of this substance is very simple: the iron which enters into the composition of the ink is transformed by the reaction into the black sulphide.

Vibrations Produced by Railway Trains. — Prof. H. M. Paul has communicated to the Seismological Society of Japan some interesting notes on the effect of railway trains in transmitting vibrations through the ground. A box, holding about 20 lbs. of mercury, thickened by amalgamation with tin, was placed upon a heavy plank screwed to the top of a post sunk four and one half feet into the ground. Images reflected in the surface of the mercury were observed by a telescope, as in meridian observations. An express train, passing at a distance of one third of a mile, set the surface of the mercury in confused vibration for two or three minutes. Other observations were made at stations at somewhat greater distances. The experimenter also found that a one-horse vehicle passing along a gravelled road 400 or 500 ft. distant caused a temporary agitation of the mercury whenever the wheels struck a small stone.

Utilizing Orange-Peel. — A gentleman in Manchester claims to have succeeded in applying orange-peel to a very useful purpose. Orange-peel, after being dried in an oven until all the moisture has been expelled, becomes readily inflammable, and serves admirably either for lighting fires or for resuscitating them when they have nearly gone out. Thoroughly dried orange-peel will keep for a very long time, and might be collected while the fruit is in season, and stored for winter use.

ELECTRIC SPARKS.

Curious Electrical Phenomenon. — The signal officer at the summit of Pike's Peak, Sergeant Day, has lately observed a curious phenomenon. On opening the door at 8.45 P. M., the telegraph line on the summit was seen distinctly outlined in bright light, which was thrown out from the wire in beautiful scintillations. These, seen nearer, had the appearance of little electrified brushes or inverted cones of light, with their points to the line, whence they issued in little streams, about the size of a pencil lead, of bright violet color, while the cone of rays was of a brilliant rose-white. These cones pointed in all directions, and were constantly jumping about. There was no heat to the light, though one could not touch one of the little flames, for as soon as the finger was brought near, they would instantly vanish, or jump to another point of the line. By passing along the line with finger extended, these little jets of flame were successively "puffed out," to be instantly relighted in the rear. Every exposed metallic point or surface was similarly tipped or covered. The cups of the anemometer appeared as a solid ring of fire, with a loud hissing noise. On bringing the hand near the instrument, no heat was felt; but the hand instantly became aflame, and on raising it and spreading the fingers each of the latter became

tipped with cones of light. There was a feeling as of a current of vapor escaping, and a slight tingling sensation. Other parts of the body were lighted up also.

CHEAP INSULATING MATERIAL. — It is thought that the demand for a cheap insulating material has been met by a discovery of a method by which wood, sawdust, cotton waste, paper pulp, and other fibrous substances can be converted into a material perfectly impervious to moisture and acids, easily moulded, under pressure, into any shape, and capable of being worked or cut into any form. This material is an excellent non-conductor of electricity, and can be used for all forms of battery cells, telegraph insulators, supports for electric-light leads, and telephone work. It affords the means of securing perfect insulation at a very much less cost than ebonite or gutta percha.

ELECTRICITY IN CHINA-WARE MANUFACTURE. — A beginning has recently been made with the utilization of electricity for clearing china paste prior to baking it. It is a known thing that there are oftentimes black specks on the surface of china ware, which greatly take off from its value, sometimes as much as 40 per cent. Of course, it is in the manufacturer's interest to obviate this drawback. The specks alluded to arise from the presence of diminutive particles of iron, and these, it has now been found, can be removed with a magnet. Two large French manufactories have already been fitted up for that purpose. On an average, the electro-magnetic machines used extract from seven to eight pounds of iron from 100,000 pounds of china earth that are submitted to them.

HOUSEHOLD HINTS.

VINEGAR FOR THE SICK-ROOM. — There is a French legend that during the plague at Marseilles a band of robbers plundered the dying and the dead without injury to themselves. They were imprisoned, tried, and condemned to die, but were pardoned on condition of disclosing the secret whereby they could ransack houses infected with the terrible scourge. They gave the following recipe, which makes a delicious and refreshing wash for the sick-room: Take of rosemary, wormwood, lavender, rue, sage, and mint a large handful of each. Place in a stone jar, and turn over it one gallon of strong cider vinegar; cover closely; and keep near the fire for four days; then strain, and add one ounce of powdered camphor gum. Bottle and keep tightly corked. It is very aromatic, cooling, and refreshing in the sick-room, and is of great value to nurses.

TO REMOVE OLD PAINT AND PUTTY. — To remove paint from old doors, etc., and to soften putty in window frames, so that the glass may be taken out without breakage or cutting, take one pound of pearlash and three pounds of quick-lime; slack the lime in water, then add the pearlash, and make the whole about the consistence of paint. Apply it to both sides of the glass, and let it remain for twelve hours, when the putty will be so softened that the glass may be taken out of the frame without being cut, and with the greatest facility. To destroy paint, lay the above over the whole body of the work which is required to be cleaned, using an old brush (as it will spoil a new one); let it remain for twelve or fourteen hours, when the paint can be easily scraped off.

ORANGE WINE. — The oranges must be perfectly ripe. Peel them and cut them in halves, crosswise of the cells; squeeze into a tub. The press used must be so close that the seeds cannot pass into the must. Add two pounds of white sugar to each gallon of sour orange juice, or one pound to each gallon of sweet orange juice, and one quart of water to each gallon of the mixed sugar and juice. Close fermentation is necessary. The resultant wine is amber-colored, and tastes like dry hock, with the orange aroma. Vinegar can be made from the refuse, and extract from the peels.

THE CASTOR-OIL PLANT AS A FLY POISON. — A botanist of Limoges (France) asserts that, having placed a castor-oil plant in a room infested with flies, they all disappeared as if by enchantment. He afterwards found under a castor-oil plant a large number of dead flies, all on the under surface of the leaves. M. Rafford, the author of these remarks, believes that some toxic principle or essential oil exists in the leaves of the castor-oil plant which is very destructive to insect life. It would be interesting to find out whether a decoction of the leaves of the *Ricinus communis* would destroy the green aphis and other noxious insects which affect roses, etc. Castor-oil plants are much used in France as ornamental objects in rooms. They will now be doubly prized for this purpose.

TO REMOVE TAR FROM THE HANDS. — It is said that tar may be instantaneously removed from the hands by rubbing with the outside of fresh orange or lemon peel, and wiping dry immediately. It is astonishing what a small piece will clean. The volatile oils in the skins dissolve the tar, so that it can be wiped off.

Practical Chemistry and the Arts.

ON THE ESTIMATION OF WATER IN SOAP.

THE estimation of water in soap with any degree of accuracy involves a different method with potash soaps from that employed with soda soaps.

With soda soaps the water may be quite accurately determined by the method given in the last number of the JOURNAL OF CHEMISTRY: namely, cutting the soap into thin slices, heating at first moderately, and then at the heat of boiling water in an oven.

The potash soaps, however, require a more accurate method, which consists in evaporating in a weighed beaker over a water-bath in the presence of absolute alcohol. The great affinity of alcohol for water insures the complete estimation of all the water in the soap, even to .01 of one per cent.

During the evaporation a constant stirring must be kept up with a glass rod, so as to insure the separation of the last traces of the water, which, without the stirring, would be "occluded" in the soap. The percentage of water by this method exceeds that obtained by the heating method by at least seven per cent. The reason for the use of this method lies in the fact that potash soap "occludes" a certain amount of water, no matter how long it may be heated in an oven at 110° C. Even soda soaps do not give chemically accurate results by the *heating* method; but it is a good way for commercial purposes, though for soda soaps alone. B.

PERSIAN INSECT POWDER.

INSECTICIDES are almost as numerous as the insects that they are destined to exterminate, but unfortunately many of these are as dangerous to men and animals as to insects. This is especially true of Paris green, corrosive sublimate, and the vapors of carbon disulphide. For the extermination of roaches borax is often an efficient and always a harmless means, convenient and cheap.

Another substance, now used very largely as protection against ants, roaches, and other household pests, is made by pulverizing certain flowers which belong to the *Pyrethrum* family. They are sold in a very fine powder, like dust, and some have thought it acted mechanically, but this idea is incorrect. On the contrary, the different kinds of flowers which are used as insect destroyers (chiefly *Pyrethrum roseum* and *Pyrethrum cinerariæfolium*) can be employed in a great variety of ways.

We are indebted for our knowledge of the insecticide properties of these plants to an Armenian named Jamtiloff,[1] who found out the origin and source of the so-called Persian insect powder. He never undertook its manufacture, however, on a large scale, but in 1828 his son began to put large quantities into the market, and it has since become an important branch of trade.

Jamtiloff's investigations were limited almost exclusively to the blossoms of the *P. roseum*, as the *P. cinerariæfolium* was not known until a later date. Since then a large number of other varieties have been found to exhibit similar properties. In Dalmatia different varieties of pyrethrum are cultivated; but the plant occurs wild in the Russian province of Transcaucasus, and is not cultivated there, as was recently stated by Dr. Gustav Radde in his report to the Department of Agriculture. Hutton, the United States vice-consul in Moscow, confirms this, and says that it is very difficult to obtain its seeds, which proves that it is not a regularly cultivated plant.

In Dalmatia, too, the natives show a certain reluctance to distributing pyrethrum seed among foreigners, and when exceptions are actually made the seeds are said to be so manipulated that they are absolutely incapable of germination. For this reason it is difficult to make any more accurate statements about Dalmatian insect powder than those already to be found in botanical works and the professional papers. The seeds of *P. roseum* are easier to obtain in commerce, and the plants are cultivated in America for ornament. Mr. Peter Henderson, of New York, recently said that the plants are easily cultivated by seeds and by cuttings, and this has been done for about ten years, although not on a very large scale. We have similar reports from Florida and California. A small quantity of California insect powder has already come into the market, and is said to be excellent.

In 1860 Willemot[2] tried to cultivate pyrethrum in France, but little is said about the result. He recommended a fresh, dry, and rather silicious soil for its cultivation. Moisture and clay are injurious; a southern exposure is best. The seed is planted from March to April (even in February, if the weather permits), lightly covered, firmly pressed down and rolled. It must be wet every five or six days. The seeds come up in from four to six weeks, and as soon as the little plants are strong enough they are transplanted, and placed six inches apart. After this they require but little wetting. The plants blossom from May till September in the second season. Cold does not seem to hurt them.

These remarks, taken from Willemot's results, of course apply to the climate of Southern France. In other places it might be necessary to adopt other precautions. The *American Agriculturist* recommends similar treatment as in the cultivation of the common garden asters.

G. N. Miles[3] of Stockton, Cal., has published the results of cultivating Dalmatian pyrethrum in America. There the plants are called "Buhach," and the powder made from the flowers has proved to be excellent. In opposition to the French authority above quoted, Miles recommends a sandy clay soil, well manured. He mixes the seeds with sand before sowing, rakes them in, and wets them every evening until they are large enough to transplant. It may be that the peculiar formation of the California soil necessitates a different treatment from that in other sections of country.

The usual method of using insect powder by "blowing" it about is well known; less common is the use of a tincture, made by percolating four ounces of the powder with one pint of strong alco-

[1] American Naturalist

[2] Pharmaceut. Jour. and Trans., March 25, 1882.

[3] Report of Commissioner of Patents, 1861, pp. 223–331.

hol. The best way to apply this is with an atomizer. Mixtures are sometimes made with oil of turpentine, corrosive sublimate, and the like, but the simple tincture, if the powder or flowers are good, does good service.

According to Prof. C. V. Riley, the active constituent of the insect powder is an essential oil, and for this reason the powder must always be used *fresh*.

The following combination is highly recommended:

Powder of pyrethrum	16 parts.
Powder of camphor	16 "
Powder of colocynth	16 "
Oil of lavender	1 part.

This has also been commended as a remedy for moths.

Insect powder does not kill bed-bugs and other insects instantly, but for a few minutes they are stupefied, and sometimes, unfortunately, they recover from it.

Insect powder is also useful for fumigation, as the essential oil, which is its active constituent, is thereby diffused through the air. Decoctions are less active than alcoholic tinctures, because a portion of the oil is dissipated and lost in making the decoction. A better way is to suspend the powder in water.

Parisel extracted a soft resin from the root of pyrethrum, by means of alcohol and ether, and gave it the name of "pyrethrin." Koene, however, denies that it is a definite substance. Hanamann, who examined the flowers, could not discover any narcotic base in it, and attributed its action to the volatile oil, as stated by Riley. H.

INDUSTRIAL MEMORANDA.

"Mysterious" Boiler Explosions. — The *Locomotive* recently received a communication from a well-known dealer in machinery, giving a striking illustration of the usual causes of many of our so-called "mysterious" boiler explosions. The gentleman says: A gentleman applied to us for a "cheap boiler," one that "would be good for two pounds or so." The only one we had had just been tested at 150 pounds to the square inch, but that was "too good." He said he once bought one for $30, and ordered a young man in his employ to get up steam in it. He went away, and was gone longer than he expected, and on his return he found a raging fire in the furnace, a pot filled with bricks on the safety-valve lever, and a very much frightened young man hanging on to the same lever with all his weight and both hands. The boy said, in explanation, that he did n't know anything about a boiler, but he supposed that if he "let any steam get out of that thing on top, it would blow him and the shop to smithereens." "Ah," said he, "I'm glad ye came, for I could n't howld it much longer." It evidently came very near being another "mysterious" explosion.

Colored Luminous Paint. — Luminous paint as hitherto made has a yellowish-white appearance in daylight. A Dresden firm now produces various paints, — pure white, blue, red, green, violet, and gray; so that the objects, which become luminous at night, may have a pleasing appearance by day.

A Gunpowder Engine. — An engine propelled by gunpowder has been patented in Germany by Herr Beck. A piston is forced to and fro in a horizontal cylinder by small quantities of powder ignited on either side alternately. Powder-pans are provided on the bottom within, on which, at the proper moment, powder falls through passages from two holders, which rest on distribution-slides. The igniting of the powder is effected by means of spirit or gas flame from the cylinder cover, drawn in through an oblique aperture by the suction force of the piston. The access is regulated by slides. The gases of explosion are expelled through holes furnished with slides on return of the piston. The heavy residues are pushed by the piston into bags, which are emptied at intervals. It is claimed for the new motor that, with small occupied space, it is very effective, and easily set at work. The consumption of powder is comparatively small, and the engine regulates itself. The danger is represented as slight.

Water-Proof Parchment Paper. — According to the *Journal of the Society of Arts*, a strong water-proof parchment paper is obtained by thoroughly washing woollen or cotton fabrics, so as to remove gum, starch, and other foreign bodies, and then immersing them in a bath containing a small quantity of paper pulp. The latter is made to penetrate the fabric by being passed between rollers. Thus prepared, it is afterwards dipped into sulphuric acid of suitable concentration, and then repeatedly washed in a bath of aqueous ammonia until every trace of acid has been removed. Finally, it is pressed between rollers to remove the excess of liquid, dried between two other rollers which are covered with felt, and lastly calendered.

Utilizing Sand Employed for Grinding Glass. — The sand which is used in grinding glass plates, and so is mixed with glass-dust, is utilized by M. Motte, of Dampremy, near Charleroi, for production of keramic ware, such as solid or hollow bricks, simple building stones, or ornamental stones. These products have great firmness, a pleasant, unalterable color, like that of French sandstone, and small specific gravity (under 1.5). They are produced by the ordinary method; the moistened sand can be easily moulded.

Steel Casks. — A Wolverhampton firm have turned their attention to the manufacture of casks and barrels of steel. The two edges of the sheet of steel which form the cask are brazed together in such a manner as to justify the title of "seamless," which the patentees have applied to these productions. The head of the barrel is also riveted to the body, so as to leave no seam, and the end rims are shrunk on hot, thus making a very solid end, whilst, at the same time, the rims are thick enough to give a good purchase to the grappling-hooks of hoists and cranes, for loading and unloading purposes. The bush for the tap does not project beyond the rim, so that the nozzle is not liable to be knocked about and injured. The casks are more durable than wood, less bulky and lighter, — an 18-gallon steel cask weighing some 10 lbs. less, — a not unimportant consideration as regards transit. In point of shape the steel barrel is exactly that of a well-formed wood one, the bulge of the belly allowing of its being easily rolled along, and better managed by one man than drums can be by two.

LABORATORY NOTES.

Substitute for the Sand-Bath. — From time immemorial, chemists have used a sand-bath where a temperature is to be obtained higher than that of the boiling of water or of oil. The method is not wholly rational, however, sand being a very bad conductor of heat. Herr Kristalba has lately recommended the substitution of pounded fragments of graphite: they let the heat pass much better, do not oxidize, and do not soil the enclosing vessel. *L'Electricité* commends the method to electricians who have to make researches in thermo-electricity, adding that small shot of iron would serve nearly the same purpose. For more intense heats, it is known, melted lead can be used.

Soluble Prussian Blue. — The usual process for preparing soluble Prussian blue consists in precipitating a ferric salt with an excess of ferro-cyanide of potassium, and washing the precipitate on a filter with distilled water until the filtrate begins to show a blue tinge. The precipitate is then dried at a gentle heat. As the manipulation is a long one, M. V. Demandre, a French pharmacist, proposes instead the following rapid and easy process: —

Pure Prussian blue	ʒv.
Ferro-cyanide of potassium	ʒiiss.
Distilled water	q. s.

Rub the two salts to a fine powder in a mortar, and add from two to four pints of distilled water, according to the strength desired. After half an hour's contact, with occasional agitation, the clear liquor may be decanted or filtered off from the insoluble portions.

To Distinguish Cotton-Seed Oil from Olive Oil. — Professor Zecchini takes pure colorless nitric acid of the density 1.40, and mixes it with half the quantity of oil in a tin tube closed with gum. After shaking it for several seconds, the tube is allowed to rest in a vertical position for five or six minutes. If the oil is from olives, the liquid is at first pale or colorless, changing to an ashy gray, with a slight yellowish hue. Cotton-seed oil is at first of a golden yellow, then copper-colored, becoming almost black. The reaction is delicate enough to detect an adulteration of five per cent. of cotton-seed oil.

PRACTICAL RECIPES.

Ink. — A Russian journal recommends the following: —

Extract of logwood	100 parts.
Lime-water	800 "
Carbolic acid	3 "
Common hydrochloric acid	25 "
Distilled water	600 "
Gum arabic	30 "
Bichromate of potassium	3 "
Distilled water, enough to make	1800 "

Dissolve the extract in the lime-water, in a porcelain or well-enamelled iron vessel, over a steam-bath, with frequent stirring. Add the carbolic and hydrochloric acids, which change the solution from a red to a brownish-yellow color. After half an hour's heating over the steam-bath, set the mixture aside until cold; then strain or filter. Now add the bichromate of potassium and the gum, each separately dissolved in a considerable quantity of distilled water, and finally add enough water to make 1800 parts.

This ink has a fine red color, which quickly turns black. It does not corrode steel pens, and if it dries up needs only the addition of water.

White Japan for Reflectors. — A white paint for lamp reflectors, which has a fine porcelain finish and needs no heating, is made as follows: Mix pure white zinc (dry) with sufficient soluble glass (silicate of soda) to be easily applied with a brush. Apply one coat, and dry by artificial heat, if convenient; then apply a second heavy coat, and dry either in an oven at from 150° to 200° F., or at ordinary temperature.

Cement for Handles. — A material for fastening knives or forks into their handles, when they have become loosened by use, is a much-needed article. The best cement for this purpose consists of one pound of yellow resin and eight ounces of sulphur, which are to be melted together, and either kept in bars or reduced to powder. Two parts of the powder are to be mixed with one part of iron filings, fine sand, or brick dust, and the cavity of the handle is then to be filled with this mixture. The stem of the knife or fork is then to be heated and inserted into the cavity, and when cold it will be found fixed in its place with great tenacity.

Over the Brünig Pass, which is familiar to Swiss tourists, and is situated 430 meters above the Lake of Brienz, and 600 meters above Lake Lucerne, a toothed-wheel railway (1 meter gauge) is to be shortly made, at a cost of seven million francs.

Agriculture.

THE LESSONS OF THE DROUGHT.

THE experience of the past summer has made manifest the remarkable fact that crops can grow without water, — a lesson which ought to be very assuring and comforting to every farmer. With an entire absence of rain during the two growing months of the summer, July and August, in most parts of New England, the agricultural shows the present autumn have been made conspicuous by the exhibition of vast quantities of the finest vegetables and fruits ever seen upon the exhibition tables. The eloquent Rufus Choate once said that often, in unfavorable seasons, he had been made very sad and desponding by mingling with farmers, and listening to their doleful prognostications; but he had learned that somehow, when the time for the annual Thanksgiving came round, the farmers were all ready, with their families, to give thanks for the abundant crops. This year we must, as usual, give thanks, if not for full, for very fair, general crops. The copious rains which fell in the early part of September revived the parched vegetation wonderfully, giving partial crops on fields where none were expected. In thirty-six hours after the rains the green grass appeared, pushing its way up through the crisp dead stubble of the fields and pastures, and in one week every field was as green as it was in June.

The recuperative powers of nature are very wonderful, and experiences like those of the present season are well calculated to sustain hope, even under the most discouraging circumstances. The improved methods of soil cultivation have had much to do in warding off the fatal influences of drought. Rain withheld for long periods, in the early history of New England, proved more disastrous to crops than drought can be now, as we stir the soil more, and know better how to plant seeds, than formerly. Knowledge is powerful in mitigating the evils flowing from an excess or scarcity of rain.

A LITTLE WONDER.

A FRIEND has kindly sent to us what appears to be a seed of some kind, and which possesses characteristics of a peculiar and interesting nature. This seed, held in the hand or placed on a book or table, appears to be endowed with life, and at once proceeds to move about, tumble over, and jump from one side to the other. Held between the fingers, a distinct intermitting throb is felt, proceeding from the interior; and when placed close to the ear, this throb or knocking becomes audible, and as many as sixty distinct knocks have been heard in forty seconds. The force of these mysterious blows given in the interior is surprising; they jar the whole structure of the seed, and knock it about in a lively way when placed in a free position. The development of a proportional force inside of Barnum's elephant Jumbo would render it unsafe for any one to occupy a position very near him. The size of the seed is that of a fourth part of a pea, divided longitudinally; and it almost exactly resembles such a fragment of a dried pea.

The donor of the seed states that it came from Mexico, and is called the "Mexican bean." Doubtless others have seen this curious seed, and can explain the cause of its strange antics, but we cannot. The force is not dependent upon heat, or its absence, for it moves with equal facility upon the surface of dry ice and a warm plate; neither has the presence of moisture anything to do with it, and light or darkness is not a disturbing agent. We shall be pleased to learn what others know about this lively little seed.

ATMOSPHERIC NITROGEN.

THE *Journal of the Royal Agricultural Society* contains an elaborate report on "The Rain and Drainage Waters at Rothamsted," by Messrs. Lawes and Gilbert. The concluding "Summary" would fill two of our pages. We have room only for the "Practical Conclusions" with regard to atmospheric nitrogen, which are as follows: —

(1.) Most of the nitrogen of farm crops is derived from the nitric acid of nitrates within the soil.

(2.) The nitric acid in the soil is produced from the nitrogenous compounds of the soil itself, from the nitrogenous organic matter of animal and vegetable manures, from the ammonia of artificial manures, and from the ammonia supplied by rain and condensation from the atmosphere. A very small quantity of ready-formed nitric acid is supplied by rain and condensation from the atmosphere. Nitric acid is also provided by the direct application of nitrates.

(3.) The ammonia of ammonium salts is rapidly converted into nitric acid in the soil, as also is the nitrogen of some organic matters, such as urine. The nitrogen of rape cake, that of the less soluble parts of farm-yard manure, of stubble, of roots, etc., is much more gradually converted into nitric acid, and it may require many years for the conversion of the whole of it. The nitrogenous compounds of the soil itself are very slowly converted into nitric acid, but the soil yields a certain quantity every year.

(4.) When there is no vegetation, and there is drainage from the land, or even when there is vegetation and excess of drainage, nitric acid is lost by drainage.

(5.) As in the case of permanent grass land the soil is always covered with vegetation, there will be with it the maximum amount of nitric acid utilized by the crop, and the minimum amount lost by drainage. Land without vegetation will be subject to the maximum loss of nitric acid by drainage.

(6.) The power of a growing crop to utilize the nitric acid in the soil is much diminished if there be a deficiency of available mineral constituents, and especially of potash and phosphoric acid, within the reach of the roots.

(7.) As the various crops grown upon a farm differ very much as to the period of the year of their most active growth, the length of time they remain on the land, and the character and the range of their roots, their capacity for taking up nitric acid from the soil is very different.

(8.) The recognized exhausting character of corn crops is largely due to the limited season of their active growth, and the long period during which the land is bare, or there is little growth, and so subject to loss of nitric acid by drainage.

(9.) When salts of ammonium, or nitrates, are applied as manure, the chief, if not the only, unexhausted residue of nitrogen left within the soil available for future crops is that in the increased roots and other residues of the crops; and this is only slowly available.

(10.) When oil-cakes or other foods are consumed by stock, the formation of nitric acid from the manure produced is slower, but continues longer, than when salts of ammonium are used. When there is a liberal use of animal manures, an accumulation of nitrogenous and mineral matter takes place in the soil, and such accumulation is known under the term "condition." Under such circumstances the fertility of the soil is maintained, or it may even be considerably increased.

ON THE FIXATION OF AMMONIA BY CERTAIN SALTS.

THE following article, by M. Baye, is translated expressly for the JOURNAL from *Le Moniteur des Produits Chimiques*, and will, we think, prove of interest to our agricultural readers: —

For some time past certain impure salts of potash have been employed to fix the carbonate of ammonia in manures. The author proposes to determine the amount fixed by sulphate of potash, gypsum (sulphate of lime), kainite, kieserite, sulphate of magnesia, and chloride of potassium.

The formula of kainite is $2(MgSO_4) + KCl + 6\ H_2O$; of kieserite, $MgSO_4 + H_2O$.

The following process was adopted. In the morning each of these substances was mixed in a mortar with 10, 30, 50, and 80 per cent. of carbonate of ammonia. These mixtures were moistened with water, and at the end of twenty-four hours were heated over a water-bath to drive off the excess of ammonic carbonate. The residue was placed on a filter, and enough water added to bring up the filtrate to a definite volume, in a fractional part of which the nitrogen was determined, and from this the amount of ammonic carbonate fixed by the salt was estimated.

The following table gives the results of these experiments. The figures in parentheses show the position occupied by each salt in relation to the amount of ammonic carbonate fixed by it.

	Mixed with 10 % of Carbonate.	20 %.	30 %.	50 %.	80 %
	grams.				
(1) Sulphate Potash .	.005	(1) .008	(1) .010	(1) .016	(1) .0
(2) Gypsum	.070	(4) .120	(5) .220	(6) .550	(6)
(3) Kainite	.080	(2) .090	(3) .150	(2) .220	(3)
(3) Kieserite	.080	(2) .090	(2) .130	(4) .240	(4)
(5) Sulphate Magnesia	.100	(5) .200	(4) .180	(3) .230	(3)
(6) Chloride Magnesium	.110	(6) .220	(6) .350	(5) .470	(5)

It will be seen by the inspection of the horizontal lines that the quantity of ammonia fixed increases with the percentage of carbonate of ammonia in the mixture.

On inspection of the vertical columns it will be seen that the sulphate of potash has fixed less ammonia than any other salt. In the mixture poorest in ammonic carbonate, the gypsum has fixed less than any other salt except the sulphate of potash; while, on the contrary, in the richest mixture the gypsum has retained more ammonia than all the other salts. There appears to be a double decomposition, with the simultaneous formation of insoluble carbonates and ammoniacal salts.

By examining the last four vertical columns, we also see that in the mixtures containing 20 % and over of carbonate of ammonia the gypsum and chloride of magnesium have fixed the most ammonia. The author foresees as an objection to the employment of chloride of magnesium that it will introduce into the soil chlorides harmful to vegetation; but it is stated by Maercher, in his work "Die Kalisalze und ihre Anwendung in der Landwirthschaft," that the impure salts of potash have in a great number of cases given better results than the pure salts free from chlorine.

The reaction with carbonate of ammonia is almost instantaneous, nearly the entire amount being fixed

immediately. Thus in a mixture of 10% ammonic carbonate, the gypsum fixed immediately 53.50%, in twenty-four hours 60.00%, in forty-eight hours 61.50%, and in one hundred and twenty hours 74.80%.

From these very interesting experiments it appears that several other salts possess the power of fixing ammonia in the soil, as well as gypsum, and it seems quite probable that a large part of the benefit received from the use of the Stassfurt potash salts is due as much to this fixing power as to the potash they contain. They also explain the fertilizing power of gypsum, a matter which has always been more or less obscure.

Doubtless there are other salts which possess this same fixing power, and further investigations may result in some very valuable additions to our list of chemical fertilizers.

SLIPPING PLANTS.

When the shoot of a verbena, geranium, fuchsia, begonia, stevia, or plants of that character is bent, if it breaks or snaps clean off, then it is in the proper condition for rooting; if flexible, it is not. Take any common saucer or plate, into which put sand to the depth of an inch or so. Then prepare the cuttings in the usual manner, and place them in the sand close enough to touch each other. The sand is then to be watered, so as to bring it into the condition of mud. The saucer thus filled with slips may be placed on the window-sill, and exposed to the sun. The cuttings must be fully exposed to the sun, and never shaded. But one condition is absolutely essential to success: *until the cuttings take root the sand must be kept continually saturated with water, and always in the condition of mud.* To do this the slips must be watered at least once a day with a very fine rose watering-pot; and the watering must be done very gently, else the cuttings may be washed out. There is every certainty that ninety-nine per cent. of the cuttings put in will take root, provided they were in the proper condition when placed in the saucer, and that the temperature has not been lower than sixty degrees for green-house plants, or lower than eighty degrees for tropical plants. By the saucer system a higher degree of temperature may be maintained without injury than by any other system of propagation, as the cuttings in reality are placed in water, and will not wilt, provided the water is not allowed to dry out. When rooted they should be potted in dry soil, such as is recommended for sowing seeds in. They should be placed in pots not exceeding two and a half inches in diameter, and treated carefully by shading and watering for two or three days.

DAIRY NOTES.

Dutch Cows at Home. — A foreign journal says: One of the most noted farms in Europe is that of Amersfoordt, upon the Haarlemameer, about two hours' drive from Amsterdam. About 100 cows in milk are kept upon this estate. A daily milk record of each cow is kept, and the quality of milk of each animal is recorded upon Saturday of each week. The largest records for the year 1881 were as follows: Uitzet, 3993 liters = 8784.6 lb. avoirdupois; Wertze, 4263 liters = 9378.6 lb. avoirdupois; Vasje, 4886 liters = 10,749.2 lb. avoirdupois; Walsje, 5124 liters = 11,272.8 lb. avoirdupois. The quality generally ranged from 10 to 13 per cent.; extremes 8 to 16 per cent. In the herd of Mr. Bultman, president of the Netherlands Association, was one cow whose record for last year was 5108 liters, or 11,237.6 lb. avoirdupois. A two-year-old heifer owned by this gentleman had given 3000 liters, or 6600 lb., during the past four and a half months. On the Model Farm at Winkle, in 1880, the following records were made, the highest ever produced at that establishment: Guurtje (206), Netherlands *Herd Book*, in 357 days gave 12,981 lb. avoirdupois; Grietje (207), Netherlands *Herd Book*, in 315 days gave 11,608 lb. avoirdupois.

Milk Swindling in Paris. — Soon after the opening of the Municipal Laboratory of Paris an important capture of milk adulterators was made at the station of Batignolles. These milkmen filled a part of their measures with water from the taps at the station, and mixed it with the milk brought by railway. They used, besides, bicarbonate of lime, and a dye to color the cream. Those who received the milk sealed employed small stoves, formed of a round case (for conserves), placed on the lantern of the cart, with wax contained in a small tin goblet. The seals were adroitly cut after slight heating, and afterwards renewed. It is unnecessary to say that all these objects were confiscated, and the delinquents cited before the tribunal.

A French Creamer. — A simple creamer, devised by M. Fouchier, has recently attracted some notice in France. It acts on the siphon principle. An elongated tin vessel, narrowing downwards, holds the milk, and a siphon is supported on the edge, so that the smaller branch descends to the bottom. The long branch being stopped, and the skim milk brought into the siphon by suction of an attached tube, the stopper is removed and the flow proceeds. The cream, too thick to rise in the siphon, remains in the vessel. The siphon is easily cleaned with hot water.

Milk from Tuberculous Cows. — Mr. Vacher, in the Section on Public Medicine of the British Medical Association, said that "milk from tuberculous cows must be regarded as dangerous, but the transmission of the disease by milk was almost incapable of proof, the milk ingested by the person developing signs of phthisis being but one of many possible sources of the disease. The practical course was to boil all milk to be used as food."

GLEANINGS.

The Longest Fence in the World. — The longest line of fence in the world will be the wire fence extending from the Indian Territory west across the Texas Pan-Handle, and thirty-five miles into New Mexico. We are informed that eighty-five miles of this fence is already under contract. Its course will be in the line of the Canadian River, and its purpose is to stop the drift of the Northern cattle. It is a bold and splendid enterprise, and will pay a large percentage on the investment. The fence will be over 200 miles long.

Trees on the French National Roads. — Statistics have been published by the French Department of Public Works relative to the planting of trees along the high-roads of the country. The total length of the Routes Nationales is 39,938,126 meters, of which 23,731,928 meters may be bordered with trees. Of this distance, 14,335,311 meters are planted, while 9,396,617 meters remain to be done. The number of trees used to form the welcome avenues is 2,691,698.

Watermelon Sugar. — Mr. W. W. Seay, of Rome, Georgia, is experimenting with watermelons for the purpose of extracting sugar. His experiments so far, in a small way, induce him to believe that a fair lot of melons contain an average of seven per cent. of saccharine matter, or pure sugar. He estimates that on one acre of good land, suited to their growth, 34,500 pounds of melons would grow, and these would produce, at seven per cent. of saccharine matter, 2415 pounds of sugar, and worth, at ten cents, $241.50. This sounds very well, but the results of a few practical experiments would be more satisfactory.

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON, NOVEMBER 1, 1882.

ASBESTOS.

No department of the Institute Fair, now open in this city, presents greater interest in a certain direction than that devoted to a display of fabrics from the curious mineral asbestos. It is true, fabrics such as cloth and gloves had been produced from asbestos by artisans living centuries ago, even as far back as the first century of the Christian era. The gossipping Pliny describes asbestos, but he was entirely ignorant of its true character. He supposed it was wood, or a vegetable product, and at the same time speaks of it as good for making *incombustible* clothing. It is plain, therefore, that we were anticipated in its industrial uses, as a fire-proof material, by at least twenty centuries. The Greeks and Romans had also what they called *amianthus*, which was the same thing, the word meaning *undefiled*, alluding to the ease of cleaning the cloth by throwing it into the fire. We still retain the word *amianthus*, and apply it usually to the finer and more silky kinds of asbestos. There is a kind called *mountain leather*, in which the fibres are interlaced, and appear in sheets; also another called *mountain cork*, which is so light that it floats on water. It thus appears that pumice stone is not the only form of mineral which does not sink in water.

Asbestos in the mineral world is as wonderful as cork in the vegetable. Both are substances common to the observation of almost every one, and they subserve ends which cannot be met by any other products in nature. The dry bark of a tree is apparently as insignificant and vulgar a product as can be conceived of, but it is difficult to see how we could do without cork. By that freak of nature by which the minerals hornblende and pyroxine are made to crystallize in long glassy filaments, we have asbestos, a substance which is fibrous like cotton or wool, and which can be wrought into cloth, paper, cords, ropes, gloves, dresses, etc., which resemble vegetable textile fabrics. Fire, which so rapidly consumes vegetable fibrous substances, has no effect upon asbestos filaments; hence, fabrics of this material are fire-proof. They are also acid-proof, the stronger mineral acids, as nitric and sulphuric, not changing them in the slightest. It produces peculiar impressions when we take the soft, flexible paper or cloth, and throw it into the fire or into these corrosive acids, and observe how perfectly it withstands the ordeal. Asbestos has been used to place in funnels through which acids are passed to filter out foreign bodies. At present spun glass is substituted, as our makers have succeeded in putting glass into a form resembling the finest silk. Being soft and flexible like that substance, it is indeed very beautiful.

The exhibit of asbestos articles at the Fair is extensive, and worthy the attention of visitors. One will see on the tables long coils of ropes and cords, which resemble those made of hemp; also rolls of paper and thick sheets used for steam packing, coarser fabrics for roof coverings, and wicking material for lamps. It is difficult

to understand how it can be woven and twisted and braided, so as to subserve so many useful ends; it is also difficult to believe, as we gaze upon the piles of fabrics, that they are made out of *rocks*.

Asbestos is not a rare mineral, as it is found in most of the Middle and Northern States in this country, and in Europe, in all mountainous sections. In New York there is a deposit in Richmond County which affords fibres *two feet long*. In Brunswick, New Jersey, there is a fine deposit of the interlaced variety, the mountain leather so called. In Maryland asbestos of good quality is found in several localities. In Massachusetts it occurs at Brighton, Sheffield, Pelham, Windsor, and several other towns. The mineral is plentiful enough for all our wants, even if, some day, it is used in house construction, an event not improbable.

A DANIEL COME TO JUDGMENT.

A CORRESPONDENT, who frankly says that he is "no scientist," though he has a taste for metaphysics, sends us a long article on "Canons of Scientific Progress into the Unknown, disregarded by Professor Winchell." Our friend says some things that are true enough, as, for instance, this from the opening of his communication: —

There is a difference between facts and intellectual vagaries as great and as important as that between granite mountains and the vapors which hang around them; and when a really great man mistakes his own intellectual conceptions for scientific truths, and puts them forth as such, he becomes an impediment to real progress, the importance of which is measured by his own intellectual force. When a weak mind crystallizes an erroneous idea, it is of little consequence; but when a really great man makes a mistake his error remains, sometimes for centuries, a stumbling-block to the human race.

The first direct charge — and really the only one — that the writer brings against Dr. Winchell is that he assumes the earth to be "cooling," which is a mere "vagary," and all the deductions from it worthless. The earth cannot be cooling, we are told, because "all organic life is storing up latent heat, year by year, from the sun, and the heat in the coal which warms us in winter has been lying in nature's storehouse for many centuries." But if, as our friend admits, it "may be true," as Dr. Winchell asserts, that "the aggregate of heat received by the earth annually, from all sources, is less than the total radiation," we cannot see how the storing up of a portion of the heat received is to prevent the earth from becoming cooler. If a man who has a certain capital is yearly losing more money than he receives, the fact that he puts a small portion of his receipts into a savings-bank will not make him any richer at the end of the year; his capital must have been diminished by a larger amount than he has put into the bank. That is the way our good Mother Earth is doing business, as Dr. Winchell and the great majority of scientific men believe; and our friend's book-keeping will not save her from bankruptcy in the end.

We must quote one paragraph more from this criticism: —

Geology clearly indicates that, since the earth became habitable for animals, it has changed its poles: and astronomy indicates, and will probably demonstrate, that causes now operating will produce a similar result in the distant future. When this happens, as it probably will, instantaneously, whenever the earth "loses its balance," the present surface of the earth about the poles will be bulged out more than thirteen miles, and there will be a corresponding shrinkage at the present equator. In short, the solid crust of the earth will be broken inwardly or outwardly at all points, in the process of reaching a new axis of rotation, and the fragments will be floating on the molten mass which constitutes the great bulk of the earth's volume. The organic matter accumulated in the earth's crust in all the centuries since the present poles were established will come in contact, in many places, with this internal molten mass, and the heat that will be evolved is practically incalculable. All the waters of the oceans converted into steam will hardly be sufficient to keep the temperature down to 212° F. If any of the "fittest" survive at that time, they will doubtless have stronger reasons for believing that the earth has been gathering heat than we have for believing that it is losing it.

That the position of the earth's poles is subject to certain changes, which are gradual and calculable, is a familiar fact in astronomical science, and certain theories concerning the climatic variations of former geologic ages have been based upon this fact; but we are not aware that any scientist of note believes that our planet is going some day to "lose her balance" and make a sudden lurch that will cause the poles and the equator to change places. But if this *should* happen, and if the crust of the globe *should* crack, as supposed, and the organic matter *should* burn up, and all that, we cannot see how the sum total of heat in the planet is to be increased by the catastrophe. The molten interior can have no more heat than before, and the organic matter in burning can give out no more heat than the sunbeams stored up in it. If the earth has been steadily losing more heat than she has received, her waning capital of caloric cannot be replenished by this great bonfire of the organic matter in which a portion of her receipts have been invested. She can only lose the faster by the operation; for a great part of this enormous outburst of heat will be at once radiated into space.

Of course Dr. Winchell's graphic picture of "world-making" is the carrying out of a theory; but the theory is the one now generally accepted by the best men of science. Our correspondent's objections to it are based upon a theory of his own, which seems to us much more like a mere "vagary" than the other does.

THE ROYAL SOCIETY OF LONDON.

PROFESSOR DRAPER, referring to the work accomplished by this famous association, remarks: —

We have only to turn over the pages of its *Transactions* to discern how much this society has done for the progress of humanity. It was incorporated in 1662, and has interested itself in all the great scientific movements and discoveries that have since been made. It published Newton's "Principia;" it promoted Halley's voyage, the first scientific expedition undertaken by any government; it made experiments on the transfusion of blood, and accepted Harvey's discovery of the circulation. The encouragement it gave to inoculation led Queen Caroline to beg six condemned criminals for experiment, and then to submit her own children to that operation. Through its encouragement Bradley accomplished his great discovery, the aberration of the fixed stars, and that of the nutation of the earth's axis; to these two discoveries, Delambre says, we owe the exactness of modern astronomy. It promoted the improvement of the thermometer, the measure of temperature, and in Harrison's watch, the chronometer, the measure of time. Through it the Gregorian calendar was introduced into England, in 1752, against a violent religious opposition. Some of its members were pursued through the streets by an ignorant and infuriated mob, who believed it had robbed them of eleven days of their lives; it was found necessary to conceal the name of Father Walmesley, a learned Jesuit, who had taken a deep interest in the matter; and, Bradley happening to die during the commotion, it was declared that he had suffered a judgment from heaven for his crime.

If I were to attempt to do justice to the merits of this great society, I should have to devote many pages to such subjects as the achromatic telescope of Dolland; the dividing engine of Ramsden, which first gave precision to astronomical observations; the measurement of a degree on the earth's surface by Mason and Dixon; the expeditions of Cook in connection with the transit of Venus; his circumnavigation of the earth; his proof that scurvy, the curse of a long sea voyage, may be avoided by the use of vegetable substances; the polar expeditions; the determination of the density of the earth by Maskelyne's experiments at Schehallion, and by those of Cavendish.

METEOROLOGY FOR SEPTEMBER, 1882.

THE sum of my observations on the weather for the past month has been as follows: —

Average Thermometer.		Lowest.	Highest.	Range.
At 7 A. M.	59 90°	47°	70°	23°
At 2 P. M.	69.60°	54°	84°	30°
At 9 P. M.	61.73°	45°	77°	32°
Whole month	63.74°	45°	84°	39°
Second average[1]	63.24°	45°	84°	39°
Last 19 Septembers	60.53°	54.90°	66 69°	11.79°
		In 1864.	In 1881.	
Second average[1]	59.67°	53.62°	66.12°	12.50°

[1] Found by adding the average evenings *twice*.

The average barometer for the month was 30.013 inches; the lowest, 29.60, on the 15th, and the highest, 30.20, on the 21st and 22d, a range of .6 of an inch. The average for the last ten Septembers was 30.018; the lowest, 29.926, in 1875 and 1876, the highest, 30.141, in 1873, a range of .21 of an inch. The sum of the daily variations was 3.16 inches, an average daily movement of .105 of an inch. The average for the last ten Septembers has been .119, with extremes of .074 and .160, in 1877 and 1876. The rainfall in September of those years was .45 and 3.50 inches; clearly showing that the greater *monthly*, as well as *daily*, movements of the barometer are accompanied by a greater amount of rainfall. The large amount of rainfall (3.75 inches) on the 11th and 12th of the past month was attended by a movement of .51 of an inch. Again, on the 14th, there was a movement of .46 with a fall of .5 of an inch of rain; still again, in connection with a rainfall of 4.60 inches of rain, between the 21st and 25th, the movement was .71: leaving only 1.48 movement for all the rest of the month.

The face of the sky in 90 observations gave only 32 fair, with 16 cloudy, 28 overcast, and 14 rainy. This shows a less number of *fair* observations than any month during the last 18 years, with three slight exceptions: namely, 29 in May, 1868, and the same number in May, 1878, and 31 in March, 1881. The amount of rainfall was 9.30 inches, the largest amount during the past 14 Septembers. The smallest amount

was .45 of an inch in 1877, and the largest, next to the present September, was 6.00 inches in 1872, the entire range being nearly 9 inches. The average amount for the past 14 years has been 2 81 inches.

The direction of the wind in 90 observations gave an excess of 11 northerly and 18 westerly over the southerly and easterly. This indicates the prevailing on average direction, approximately, to be west 31° 25′ north, or nearly N. W. by W. The average for the past 14 Septembers has been west 2° 20′ south. The east has prevailed over the west only once, during this period, while the south has prevailed over the north six times, with a total excess of 13; the west over the east 310.

I learn that the Signal Office in Boston report the prevailing direction of the wind to be according to that one direction of the eight taken which gives the highest numbers of observations. Take the past September at Natick for illustration. The numbers stand thus: N. 19, S. 9, E. 4, W. 5, N. E. 15, N. W. 12, S. E. 3, S. W. 23. Hence, they would report the prevailing direction to be S. W., instead of N. W. by W., as I have reported above, by combining in the result *all* the observations in the eight points.

In general, I may remark that the past month began with an unusual drouth, and this continued to increase till the 11th, with scarcely a sprinkle of rain, not enough to be measured; but then it poured, and before the next noon we had 3.75 inches of rain, illustrating the theory of the late Professor Espy, that "when one rainfall is over nature begins to prepare for another, and the longer it is delayed the more rain may be expected." This was especially true, not only in this first heavy rainfall, but in the further succession of rains, so that before the close of the month we had 9.30 inches, or 3.30 beyond any preceding September for the last 14 years. These rains, however, came too late for many crops, although improving the whole face of nature, and of great benefit to the farmer.

The general temperature of the month will be seen to be 3.21° above the average, notwithstanding the large amount of cooling rains, and also the unusual frequency of northerly winds, exceeding the average by three points of the compass. This may be owing, in part, to the long-continued heat of the preceding summer, in connection with the severe drouth. The 19th was the warmest day in September, an average of 76°, followed on the 21st by a sudden change to an average of only 56°. The 28th was the coldest day, an average of 50.3°. There were no frosts in this locality. The first third of the month, in connection with the preceding August, will be long remembered for its drouth, and the last two thirds for the unusual amount of September rains.

P. S. By the politeness of Prof. F. H. Snow, of the State University at Lawrence, Kansas, I have just received his report on meteorology for September, from which I condense a comparison with my own, on a few points. His observations (at the same hours) on the temperature and rainfall cover the past fifteen years, being four years less than my own on temperature, but one more on rainfall.

The variations of temperature stand thus: —

	Mean.	Lowest Sept.	Highest Sept.	Range.
At Lawrence.	66.34°	62.37° in '68	70.59° in '81	8.22°
At Natick.	60.53°	54.97° in '68	66.69° in '81	11.72°
	5.81°	7.40°	3.90°	3.50°

	The daily extremes.			Average extremes.		
	Lowest.	Highest.	Range.	Lowest.	Highest.	Range.
At L.	29° in '68	105° in '82	76°	39.4°	92.9°	53.5°
At N.	32° in '68	90° in '81	58°	39.4°	83.7°	44 3°
	3°	15°	18°	0°	9.2°	9.2°

Comparison for the rainfall in inches.

	Mean.	Lowest.	Highest.	Range.
At L.	3.20	1.35 in '77	6.45 in '74	5 10
At N.	2.81	.45 in '77	9.30 in '82	8.85
	.39	.90	2.85	3.75

Comparison of the barometer for September, 1882.

	Mean.	Lowest.	Highest.	Range
At N.	30.013	29.600	30.200	.600
At L.	29.155	28 816	29.417	.601
	.858	.784	.783	.001

Comparison of the winds for September, 1882.

	N.	S.	E.	W.	N. E.	N. W.	S. E.	S. W.	Excess.
At N.	19	9	4	5	15	12	3	23 =	11 N. 18 W.
At L.	0	2	20	2	9	16	14	27 =	18 S. 2 W.
	19	7	16	3	6	4	11	4 =	29 16

From the above comparisons, we learn that the average September at L. is 5.81° warmer than at N., and that the degrees of range are much greater (as 76° to 58°). In one instance (September 12th) we are informed that the mercury reached 105°, but on the following noon had sunk to 65°, a sudden range of 40°. This, however, was at the opening of a remarkably "hot blast," which continued to the 15th, "the fierce dry heat burning the green leaves of the trees, so that they crumbled to powder in the hand." This was near the close of a "seven weeks drouth, during which less than a tenth of an inch of rain had fallen." The whole rainfall of the month was only 1.65 inches, while we had 9.30 inches.

The barometer clearly shows a higher elevation of locality, with a striking equality of range.

The winds show a wide diversity from ours, especially those from the N. E. and S. E. The resultant is also widely different: that at L. being south 6° 20′ west, while that at N. was west 31° 25′ north or differing by more than ten points (115°.05′). Thus climates and countries widely differ in many respects, yet when the good and ill of each are fully compared the result may not always be so unequal as often supposed. D. W.

NATICK, *October* 7, 1882.

EDITORIAL NOTES.

DEATHS OF SCIENTISTS. — The death is announced of Friedrich Wöhler, the distinguished chemist and professor of the science at Göttingen. Born near Frankfort-on-the-Main in 1800, he acted as professor of chemistry in the School of Trades at Berlin from 1827 to 1831, and since 1836 has experimented with great success at Göttingen. He was the discoverer of aluminium, did some illustrious work with Liebig in the field of organic chemistry, wrote several well-known text-books and treatises on his special science, and for the last forty-four years has edited a chemical and pharmaceutical journal.

The death is also announced, at the early age of forty-three years, of Georges Leclanché, the inventor of the well-known galvanic cell. He quitted the service of the Eastern Railway Company of France about 1867, to devote himself to his researches on the peroxide of manganese cells.

NEW PROFESSORS AT HARVARD. — Dr. David William Cheever has been appointed Professor of Surgery by the Board of Overseers of Harvard University, and Dr. Charles P. Lyman was appointed Professor of Veterinary Medicine; the latter being required by the veterinary school which it has been decided to open in the university this fall, in which full theoretical and practical instruction in the veterinary art will be given. The regular course for veterinary students will be three years.

THE MOON AND THE WEATHER. — At the meeting of the British Association, Sir W. Thomson delivered an address to a large audience upon the tides. While explaining the theory of the moon's influence on the tides, he incidentally touched on the supposed influence of the moon's changes upon weather, and pointed out that the comparison of most careful and complete indications of the barometer, thermometer, and anemometer, and the times of the new and full moon and half moon, had failed to establish any relation whatever between them, and had proved, on the contrary, that if there was any dependence of the weather on the phases of the moon it was only to a degree quite imperceptible to ordinary observation. We might take it confidently not only that it was not proved that there was a dependence of the weather on the changes of the moon, but that it was proved that there was no general dependence of weather on the changes of the moon.

THE WORLD-CENSUS. — The total population of our globe is now reported by Drs. Behm and Wagner at 1,433,800,000. According to their last report, it was 1,445,900,000. This difference would indicate a decrease of 22,000,000, but as a matter of fact there has, according to these authorities, been an increase of more than 33,000,000. This is explained by the fact that the population of China has been very much overestimated heretofore. In the last issue of this work it was given at 434,000,000; it is now put at 379,000,000. In fact, in those countries alone in which censuses have been taken the official returns show an aggregate increase of 32,000,000 during the preceding interval of ten years. The number of people inhabiting the larger divisions of the globe, as given by Behm and Wagner, are as follows: Europe, 327,743,000; Asia, 795,591,000; Africa, 205,823,000; America, 100,415,000; Australia and Polynesia, 4,232,000; polar regions, 82,000. Russia is credited with 83,000,000 inhabitants; China, 379,000,000; Japan, 36,000,000; and British India, 252,000,000.

HINDU PLAN OF PURIFYING ROOMS. — We have received three requests for further particulars concerning the process of "leoping," to which reference is made in a paragraph on page 99 of the JOURNAL for September. We regret that we can add nothing to the information there given. The quotation from Dr. Monatt's lecture was copied from a foreign exchange, and is the only portion of the lecture that we have seen. Possibly some reader who has been in India may be able and willing to enlighten us.

A CONVENIENT CHESS BOARD. — An iron chessboard, provided with magnetic chess-men, is a Berlin novelty. The small magnets concealed in the figures cause them to adhere to the iron board and retain their places in spite of considerable shocks, such, for instance, as are received on shipboard or on railway trains.

THE SWEDISH IRON INDUSTRY. — A review of the period 1860–80 shows that, while the production increased, the number of places of production (pits, furnaces, forges) decreased quite remarkably. From about 417,000 tons of iron ore in 1860, the production rose to about 775,000 tons in 1880. The number of workmen in 1860 was 5249; in 1880 only 5038. Thus, a workman in the latter year produced nearly twice as much as one in the former. This is attributed chiefly to improved means of blasting.

LITERARY NOTES.

The Diseases of the Rectum, by William Allingham, M. D., is the fifth in the valuable "Octavo Series," published by P. Blakiston, Sons & Co., of Philadelphia It contains a complete classification of all rectal diseases, with full reports of cases coming under the author's practice, and the treatment of the same. He has evidently had a large experience in this class of diseases, and his observations will prove of great service to every physician. Price, in paper 75 cents, in cloth $1.25.

A Dictionary of Economic Plants, by Mr. John Smith, is an extremely valuable and interesting work. It gives the common and botanical name of every useful plant, with a full account of its history, uses, and properties. The medical properties, if any, are also described. The author was formerly curator of the Royal Botanical Gardens at Kew, England. Price $3.50. For sale by A. Williams & Co.

We have received from the Washington bureaus the *Report of the U. S. Fish Commission* and the *Report of the Commissioner of Education* Both of these works are of great value, and much superior to the usual public documents. The article in the Report on Fisheries, by Professor Farlow, on the Marine Algæ of New England, is especially important, and should be in the library of every student of natural history.

We have received from the Secretary of the Iowa State Pharmaceutical Association the *Proceedings* of that body for the year 1882.

Medicine and Pharmacy.

TOBACCO AND ALCOHOL FOR WORKERS.

Several eminent foreign scientists have recently published the results of their experience and observation on the tobacco and alcohol questions, and the *Nation* gives the following excellent summary of their articles on the subject: —

The Abbé Moigno and Mr. W. Mattieu Williams, the distinguished writer and scientist, give some interesting personal experiences as to the value of tobacco and "drinks," and the relation which stimulants generally hold to the production of work, intellectual as well as physical. The veteran Abbé (now an octogenarian), whose memory appears to have been, and presumably still is, of an unusually retentive kind, and who for this reason was threatened by Arago with being "burnt as a wizard," claims to have attained to "incomparable health," and to have been "one of the greatest workers" of his age, through an almost total abstinence from stimulants. To the carrying out of this principle of abnegation, doubtless helped by rigid adherence to simple dietary and other habits, are ascribed his "indefinite capacity for work," "unconscious digestion," and the possession of a countenance unmarred by either wrinkles or pimples. The only break in the illustrious health career of the mathematician appears to have been made during a brief sojourn at Munich, where, with the learned Bavarians (the most famous of whom, Steinheil, an associate investigator in the department of physics, boasted of smoking six thousand cigars annually), the Abbé indulged in the obnoxious custom of smoking and drinking; and during the period of the preparation of the "Calculus of Variations," when he discovered that his memory was rapidly failing. With the total disuse of tobacco over a period extending from September, 1863, up to June 25th of this year, the proportional increase of vegetable over animal food, and the limitation of stimulants to a daily half cup of coffee and a "small spoonful of brandy, or other alcoholic liquor," there was a speedy return of both bodily and mental vigor, and with the results characteristically described by the writer.

The experiences of Moigno are supplemented by Mr. Richard A. Proctor, the astronomer, with some of his own personal researches in the field of dietary, sanitation and mental development; the general outcome of his observations being that "for steady literary or scientific work," and "throughout the hours of work (or near them)," for most men "something very close to total abstinence from stimulants is the best policy." This is in perfect harmony with the views of Mr. Mattieu Williams, who also notes the prejudicial effects of stimulation upon certain kinds of bodily exercise. Mr. Williams's remarks are more strictly directed to the subject of pedestrianism, and as coming from one who has had a very considerable experience, both as an ordinary vacation pedestrian and as a mountaineer, deserve no little attention. He found, by practical experiment, that the use of stimulants on a foot journey, while it produced a "temporary exhilaration that was pleasant enough while it lasted," invariably, after a short time, brought on weariness, almost an inability to accomplish the last few miles of the daily stage, and the desire of "halting at a roadside 'pub.' or wine-shop for a drink on the way." No such inclination seems to have been entertained when "the only beverage was water, or water plus a cup of coffee for breakfast *only* (no afternoon tea). Then I came in fresh, usually finishing at the best pace of the day, enjoying the brisk exercise in cool evening air." As a final summing up of his observations, Mr. Williams gives it as his "firm conviction that the only beverage for obtaining the maximum work out of any piece of human machinery is water, as pure as possible; that all other beverages (including even tea and coffee), ginger-beer, and all such concoctions as the so-called temperance drinks, are prejudicial to anybody not under medical treatment. To a sound-bodied man there is no danger in drinking any quantity of cold water in the hottest weather, provided *it is swallowed slowly*. I have drunk as much as a dozen quarts in the course of a stiff mountain climb, when perspiring profusely, and never suffered the slightest inconvenience, but, on the contrary, have found that the perspiration promoted by frequent and copious libations at the mountain streams enabled me to vigorously enjoy the roasting heat of sun-rays, striking so freely and fiercely as they do through the thin air on the southward slopes of a high mountain."

FAITH AS AN ELEMENT OF SUCCESS IN MEDICINE.

The effect of the mind on the body is now recognized by all writers on therapeutics, and there can be no doubt that the patient's mind is often affected by what he sees his physician's to be. If the doctor evidently has thorough faith in the treatment he is pursuing, the patient is apt to be inspired with sympathetic confidence, and the treatment is then more likely to be successful. On the other hand, an evident lack of confidence on the part of the practitioner may cause a distrust in the sick man's mind which will perhaps interfere with the desired result. Dr. Fothergill, referring to this subject, says:

If the medical man speak to the patient with doubtful accents and hesitating utterances, he does not inspire confidence; he really sows distrust. This is the explanation of the successful treatment of a case by one man where another has failed, the remedial measures being much the same. The one carries the patient with him to the restoration of health; the other intensifies a morbid state, and tends to make it permanent.

This is a matter too little thought about. Just as a weak-willed medical man fails to do certain patients good, and lack of decision of character unfits a medical man for dealing with emergencies, where the judgment must be prompt and the action energetic, so the therapeutic nihilist, who doubts the efficacy of drugs, and leaves the patient to nature, disheartens many patients, and leaves them chronic valetudinarians; while in the hands of an enthusiast the cases would soon move onward to a satisfactory termination. There are some men who are "doubting Thomases;" there are others who decry what they do not understand, and deprecate remedies with whose potency they are unacquainted, who do infinite, immeasurable harm to their patients. An eclipse of faith in medicines has now existed some time; but the darkness is beginning to move away, and a return of faith, stronger, firmer, more capable of giving a *raison d'être* for its existence than in the past, is dawning, — the daybreak of happier times for those who are stricken down with illness, or crippled in their working power by incapacity in their digestive viscera. This therapeutic nihilism is a passing wave of opinion, a temporary mental state, the end of which is at hand; and the sooner it is over the better for all. The patient's prospects will be all the brighter; the medical man all the happier for feeling that the patient has got some "value received" in return for his outlay. A healthier condition of thought on matters medical will generally obtain; for quacks, charlatans, and irregular practitioners of all kinds are to a great extent fostered by the recent want of faith in the medical profession. When a man is sick, what he wish is to get well; the means to him is a matter comparative indifference.

TO SHOW TUBERCLE BACILLI IN SPUTU

Baumgarten recommends the followin method of showing the presence of the muc talked-of bacilli of tubercle in the sputum phthisical patients as being more convenient tha that employed by Koch (see Journal for July 1882, page 82) and equally efficacious: —

A portion of the sputum is dried on a cov glass, and then treated with potash, — one or tw drops of a thirty-three per cent. solution of caus potash added to a watch-glass of distilled wate The tubercle bacilli can then be readily seen with magnifying power of four or five hundred diam ters, and a little pressure renders them still mo distinct from the enclosing detritus of tissue. I order to preclude the possibility of confounding th bacilli of tubercle with those of other species, th cover-glass may be raised and placed aside until th layer of fluid on its under surface is dry, and the passed two or three times through a gas flame: an then on it may be placed a drop of an ordinar watery solution of aniline violet or any other n cleus-tinting preparation of aniline. All the putre faction bacilli appear under the microscope as a intense blue or brown (according to the testin agent and its strength), while the tubercle bacil remain absolutely colorless, and can be seen wit the same distinctness as in the ordinary potash prep aration. The whole process does not occupy mor than ten minutes.

THE AMERICAN STUDENT IN LONDON.

The modest and retiring character of th British medical student is doubtless well known to our readers from accounts of his behavio given by his countrymen. We are grieved t learn that this sensitive being is suffering fro contact with his rougher compeers from this sid of the ocean. Listen to his plaintive protest in the *Medical News*, one of the minor professiona journals in London: —

"I have frequently been a listener during th time that discussions have taken place at a certai large hospital in London on the subject of Ameri can students of medicine. At the particular hos pital in question, the 'Yank' is a recognized insti tution even now, but formerly it was a difficul matter for any Britisher to get within hearing di tance of the principal members of the staff during their visits to the wards. Jonathan's representative entirely shoved aside all who endeavored to see o hear, and having carefully surrounded the beds an the demonstrator, to the exclusion of regular student of the hospital, the lecturer would proceed, to th edification and, let us hope, instruction of the un tutored Westerns. Experiences of this kind hav tended rather to exaggerate our notions of the offen sive character of the American."

This is not signed "Bob Sawyer," but it i worthy of a place in Dickens's novel or Punch "Medical Student."

HOUSEHOLD DIRT AND SICKNESS.

The *London Times* has the following sensibl remarks on this subject: —

A good deal has been said at various times abo the terrible effects which may be expected to follo a whiff of offensive gas inhaled in passing a sew grating in the open street. There are no fact known to medicine which justify the belief tha

such a whiff would have any effect at all. If stinks could kill, the inhabitants of London would speedily undergo a serious diminution of numbers, and many foreign cities would be left as desolate as the ruins of Palmyra. The high probability is that those sewer gases which are the most offensive to the nose are the least likely to be deleterious, if *only on account of the haste which is made to escape from them, and of the impossibility of their presence being unperceived.* That they should be injurious to passers-by, except to the extent of producing nausea or disgust in some delicate person, seems inconceivable, especially when it is considered how largely and how rapidly they become diluted with air as they escape, and are thus exposed to the chemical influence of the great purifier, oxygen. A far more subtle enemy to health, whether at home or at the seaside, is to be found in the oftentimes cherished presence of what may be comprehensively called household dirt. The dirt of an ordinary house, the dirt which may be wiped from the walls, swept off the furniture, and beaten out of the carpets, would be sufficient, if it were powdered in the form of dust over the patients in the surgical wards of a great hospital, to bring all their wounds into a condition which would jeopardize life. It cannot be supposed that such dirt is innocuous when it is breathed or swallowed, and it certainly possesses the property of retaining for long periods the contagious matter given off by various diseases. Instances without number are on record in which the poison of scarlet fever, long dormant in a dirty house, has been roused into activity by some probably imperfect or bad attempts at cleansing. The preservation of health is not a mere mechanical question of the perfection of certain traps to drains, but depends upon the intelligent avoidance of the causes by which disease is liable to be produced.

MISCELLANEA MEDICA.

Beef-Tea. — We had occasion to observe a short time ago that our long-prized and extensively employed beef-tea was, according to the recent opinion of some physicians, of no more value than urine, which it was said very closely to resemble in composition. It is more pleasing for us now to state that, according to the researches of Kobert, which have been conducted in the laboratory of Schmiedeberg, at Strasburg, the kreatin which exists abundantly in all extracts of beef has a remarkable effect on the muscular system, inasmuch as it increases its actual power, and greatly extends its capability of continuous work. His experiments were made on frogs, and of many substances tested, besides kreatin, only hypoxanthin and caffein possessed a similar action; and hypoxanthin is likewise a constituent of beef-tea. Beef-tea, therefore, if not so highly nutritious as it is generally assumed to be, is yet not so entirely useless as some observers would have us believe. The feeling of strength which its employment gives must, apart from its actual value as a nutrient, be of great service in the treatment of the sick and convalescent.

New Method of Preparing Blisters. — M. Limonsin has devised a new form of blisters, with a view to afford to the physician a greater variety of choice in degree and kind of vesication, and also with a view of preserving the ready-made blister in better condition than is usually the case.

He spreads a thin layer of ordinary blistering cerate upon strong, thin, unsized paper, and covers it with the same. The vesicating layer is about one and a half millimeters in thickness, and one of its surfaces is camphorated. When using the blister, its outline is marked upon the paper covering it; it is then cut off, and applied to the part by means of a piece of adhesive plaster. The covering paper may be readily removed, both from the plain and from the camphorated side, by means of a wet sponge. If the physician orders a blister covered with oiled paper, it is only necessary to saturate the covering paper with oil.

The same process may be also used for the prep aration of other plasters.

Something New in Education. — Professor Esmarch, the well-known surgeon of Kiel, recognizing the advantages of immediate attendance in cases of accidents, has instituted a number of schools in that city which are called Samaritan schools. They are composed of youth of both sexes, who are so instructed that in case of accidents they can render every assistance necessary until the arrival of the physician. Professor Esmarck has written a small work upon the subject, in which he explains the various means to be employed under such circumstances. The scholars are instructed upon the formation of the bones and action of medicines in a few hours. In consequence of the success which has attended these schools, the professor has visited Berlin for the purpose of introducing the system here. Eight schools, of 40 students each, have been established in this city. Many of the most prominent physicians lecture and give demonstrations upon the structure of the human body. An important feature of this innovation is the enrolment of a portion of the police force among the scholars. It may be supposed that a policeman thus trained will be able to distinguish between cases of illness and intoxication, and not take victims of the former to the lock-up, as sometimes has happened.

The Disadvantages of Cod-Liver Oil for Young Children. — According to the *Révue Médicale*, the Council of Public Health has recently submitted, for the sanction of the Academy of Medicine of Paris, a report on the disadvantages of cod-liver oil administered to infants and young children. All physicians, they say, are aware what disastrous influence is exercised on the health of young infants by defective alimentation, and especially animal nourishment; fatty matters are as little suited to the alimentation of the newly-born infants as albuminoids, excepting always casein, which exists normally in milk, and is found to be perfectly assimilable. In fact, in the first period of life, the juices necessary for emulsifying fatty matters are almost entirely wanting. The liver, in spite of its enormous development in this stage of existence, secretes only a small quantity of bile; and the researches of Langendorf and Zweifel have proved that, in young children, pancreatic juices possess an emulsive power which is almost *nil*, or, at least, very slightly marked. These physiological considerations sufficiently indicate that, far from being profitable to the infant, fatty matters, and especially cod-liver oil, can only injure its health, and gravely compromise the integrity of its digestive functions.

Lead Poisoning. — Dr. E. S. Wood, in the article of which we have before given an abstract, remarks: —

It has been said that serious symptoms caused by lead have been produced by sleeping in freshly painted rooms, but careful investigation has shown that this is not the case, but that, where sickness has resulted under these circumstances, it has been due to the vapor of turpentine or benzine, the lead compound being non-volatile at the ordinary temperature, and when mixed with oil, etc., as in the form of paint, not being disseminated through the air in the form of dust.

An interesting feature of this disease is the varying susceptibility of different individuals. Of two members of the same family, exposed to as nearly as possible precisely the same influences, one may be affected with symptoms of lead poisoning in a short time, and the other not for many months. We cannot say, therefore, that because only one member of a family has symptoms of lead disease at any given time, the others also have not been exposed to the action of lead or some of its compounds.

Nickel-Plated Vessels. — Experiments made by H. Schultz have demonstrated that the cooking or keeping of eatables in nickel-plated vessels is entirely harmless. A dog was given, with his regular food, quantities of acetate of nickel, increasing from 0.5 to 10.5 grains per day, and did well. Moreover, the amount of nickel dissolved from nickel-plated vessels by sour eatables is very trifling.

The Bromides and Chloral in Pertussis. — Dr. Dujardin-Beaumetz recommends the following mixture as useful in whooping-cough, giving morning and evening a dessert or table spoonful, according to age, in a glass of milk to which the yolk of an egg has been added: Bromide of potash, 2 grams; bromide of soda, 4; bromide of ammonia, 2; water, 60; and syrup of chloral, 50 grams.

Chlorinated Oil in Scabies. — At the American Hospital for Skin Diseases, chlorinated oil, a yellowish oily fluid, prepared by passing chlorine gas into olive oil, has been found to be a most decided parasiticide, more particularly in scabies. In this affection a piece of cotton is saturated with the chlorinated oil, and applied night and morning. The preparation is also used in other cutaneous diseases.

Oil of Peppermint in Zona. — Dr. Meredith writes to the *Birmingham Medical Review:* I have found the oleum menthæ pip. more effective than any other form of anodyne application I have tried in allaying the neuralgic pains so often piteously complained of in cases of herpes zoster. These distressing pains — worse in elderly people — are complained of often when the eruption has disappeared; but painting the affected parts over with oleum menthæ pip. nearly always affords speedy relief. I have painted the oil over the eruption when it was out in a fresh florid condition, and that with great relief to the patient. The value of this application in pains of neuralgic character deserves to be better known than it is.

SELECT FORMULÆ.

Cologne. — Recipes for cologne are always in demand, though so many have been published. According to *New Remedies*, a very pleasant, simple, and readily prepared article may be made by the following formula: —

Oil of orange flowers (neroli)	4 parts.
" lavender (Mitcham)	4 "
" rosemary	8 "
" lemon	8 "
" bergamot	16 "
Tincture of musk	1 part.
Acetic ether	1 "
Water	158 parts.
Alcohol	800 "

Add the oils, tincture of musk, and acetic ether to the alcohol; then add the water, and set the mixture aside, in glass-stoppered bottles, until it has become perfectly clear and limpid. Draw off the clear liquid, or filter it through paper.

A very superior cologne may also be prepared thus: —

Oil of orange flowers (neroli), petale	3 oz.
" " " " bigarade	1 "
" rosemary	2 "
" orange, bitter	5 "
" lemon	5 "
" bergamot	2 "
Alcohol, deodorized	6 gal.
Water, distilled	q. s.

Dissolve the oils in the alcohol; to five gallons of the mixture add slowly and while stirring enough distilled water to render the liquid very slightly opaque. Then add the reserved gallon, which should render the liquid clear again, and set the mixture aside for several weeks. Finally filter.

Saccharate of Coffee. — Carlo Paresi, in an Italian journal, describes a new method of con-

centrating and administering the valuable and useful constituents of coffee, as follows: —

Roasted coffee (best)	1 part.
Refined sugar	2 parts.
Warm water	q. s.

The coffee is exhausted, in a convenient displacement apparatus, of all its soluble constituents, by means of the warm water; the clear brown percolate is mixed with the sugar, and evaporated, at a temperature not exceeding 50° C. (122° F.), in a suitable apparatus, to dryness. Finally, it is reduced to powder, and kept in well-closed vessels.

The evaporating vessel should be shallow, so as to present a large surface of liquid to the air; or, better still, a vacuum-apparatus may be used.

The product is a brownish powder, of a coffee odor, a sweet and slightly bitter, very agreeable taste, and very soluble in cold water. Dissolved in boiling water, it yields a very fine cup of coffee.

If made into a paste with tragacanth, it may be formed into tablets or troches, — a very convenient form of use.

LIVER PILL. — The following is a good vegetable liver pill: —

Leptandrin	½ scruple.
Podophyllin	½ "
Ext. belladon.	½ "
Ext. nux vom.	½ "
Pulv. ipecac	5 grains.

M. ft. pil. 30. Sig. One, two, or three times daily.

HONEY OF ROSE. — M. Silvio Plevani, pharmacist of the Hospital of Ponte Vico, at Brescia, suggests the following as an improvement on the formula of Mel Rosæ: —

Petals of fresh roses	125 grams.
White sugar	50 "

Beat together by gradual additions in a marble mortar with a wooden pestle. Add

White honey	350 grams.
Water	100 "
Distilled rose-water	50 "

Mix, heat in a sand-bath, and afterwards express. Let it stand and deposit, and decant.

This yields a preparation of a fine rose color, with an astringent and acid taste and marked odor. Kept in a well-stoppered bottle, it may be preserved in good condition for a year.

OLEOZE. — The German preparation called oleoze, so great a favorite in disguising unpleasant remedies and making most compounds pleasant to smell and taste, has the following composition: One part each of the oils of lavender, cloves, cinnamon, thyme, citron, mace, and orange flowers, 3 parts balsam of Peru, and 240 parts of spirits. This seems to be a pleasant preparation.

ALMOND BRAN. — The *Druggists' Circular* says that a nice form of this cosmetic may be made as follows: —

Take of

Fine oatmeal	3¾ pounds.
Coarse oatmeal	¼ pound.
Wheat flour	1 "

Mix intimately with

Oil of sweet almonds	3 ounces.

Add

Powdered borax	3 ounces.
Powdered orris root	5 "

Perfume with

Oil of lemon	½ ounce.
Oil of bitter almonds	20 minims.
Oil of rose	1 drop.

A cheaper article is made by leaving out the borax and orris root, and using a less expensive perfume.

COFFEE SYRUP. — We have already given a formula adapted to the soda-fountain. For preparing coffee as a beverage, *The Caterer* commends the following: Take half a pound of the best ground coffee, put it into a saucepan containing three pints of water, and boil it down to one pint; boil the liquor, put it into another saucepan, well scoured, and boil it again. As it boils add white sugar enough to give it the consistency of syrup; take it from the fire, and when it is cool put into a bottle and seal. When travelling, if you wish for a cup of good coffee, put two teaspoons of the syrup in an ordinary cup, and pour boiling water upon it, and it is ready for use.

FOR THE TEETH. — A preparation, said to be equal to the popular "sozodent," may be prepared as follows: —

Castile soap	75 grains.
Glycerine	75 grains.
Alcohol	1 oz.
Water	5 drachms.
Oil of peppermint	Sufficient.
Oil of cloves	"
Oil of cinnamon	"
Oil of anise	"

FACETIÆ.

LOVE AND PHYSIC. — The *Irish Times* reports that a novel method of courting a lady has been inaugurated at a small town in the vicinity of Paris. M. Bidet, who practises as a physician in Nogent-sur-Marne, where the device was first tried, had invented a liqueur, which he advertised as "specially designed for the use of ladies;" and being at some loss for a good name for it, he conceived the idea of dedicating it to the honor of the lady of his affections. Accordingly, the liqueur was christened "Navarrine," — the lady's patronymic. M. Navarrine *père* took the compliment to himself, and straightway affianced his daughter to the ingenious man of physic. Thus far everything had gone on well, but unfortunately a meddlesome journalist got hold of the true love story, and by writing ill-natured comments upon it reduced largely the profits obtainable from the sale of the liqueur. Hence recriminations and an action for defamation, which the jury decided against the physician.

A LITHOTOMIST'S PARADISE. — Dr. J. M. Fothergill, in one of his racy letters to the *Philadelphia Medical Times*, referring to the death of Professor Spence, remarks: He was a proficient as a lithotomist; and when I was a student, some twenty years ago, it used to be said that Mr. Spence had dissected the perineum in over one thousand subjects, in order to be intimately familiar with the anatomy of the region, both normally and in all the variations of its complex parts. Indeed, it used to be a student's joke at that time: "What is Spence's idea of a future state?" one would ask; the answer being, "Why, of course, the blest cutting the damned for stone." Such was supposed to be his conception of future happiness, to be eternally engaged on his favorite operation.

A LUCKY DOCTOR. — A sarcastic and would-be witty contemporary, in recording that a medical man of Rochester, United States, has earned a private box in the Opera House there for the rest of his life, because his patient, the builder and owner, although sick, did not die, but saw the completion of his Opera House, remarks, "This is reversing the order of things. It is more apt to be the doctors who confer private boxes upon their patients."

A CURE-IOUS NOTION. — *Rustic:* "Look 'ere, mister! I understood this 'ere stuff I got o' you would cure anythink." *Chemist:* "What, the 'cure-all'? Yes, so it will cure" — *Rustic:* "Well, then, there 's cert'nly somethink wrong; for I 've rubbed a whole bottleful on a ham, an' it 's no more cured than you are."

PROFESSOR E. S. WOOD, M. D., of Harvard College, and Professor B. F. Davenport, M. D., of the Massachusetts College of Pharmacy, have been appointed the analysts under the act relating to the adulteration of food and drugs in Massachusetts.

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Special Notices.

THE ARLBERG TUNNEL. — Since the completion of the St. Gothard Tunnel, the Arlberg Tunnel in the Austrian Tyrol has become the most important one under construction. The following facts may be of interest: —

Two distinct rock drills are used in the Arlberg Tunnel. That on the east side is the Ferroux drill, which has rendered such good service in the St Gothard; and that on the west the Brandt rotary perforator, which works by water under pressure. It has already given good results at Pfoffensprung, and the inventor guarantees a minimum advance of 2 meters a day, which has been considerably exceeded. The motive power is obtained by water wheels erected in the valley which separates the two slopes of the Arlberg. The following figures give the progress from the commencement, 17th November, 1880, to the end of February last: Advance of heading, 320 meters = 350 yards; mean daily advance, 3.07 meters = 10 feet; number of blasting operations, 295; advance for each operation, 1.08 meters = 3 feet, 6 inches; number of shots in each operation, 19; weight of dynamite used for each meter of advance, 22 kilograms = say 44 lbs. per yard.

GOOD WORDS FOR ADVERTISERS.

ST. LOUIS, *Aug.* 25, 1882.

SURGICAL practice does not frequently proffer the opportunity of employing nervo-tonic remedies, and therefore I am perhaps not competent to fully judge the therapeutic virtues of CELERINA, a compound lately introduced by J. C. Richardson, Esq., of this city. I have, however, used it, and with very satisfactory results, in at least twenty appropriate cases, and feel persuaded that it develops most happy actions, and that it deserves the attention of medical practitioners, more especially of those employed in the treatment of nervous afflictions I shall certainly continue to test it more fully, and report my observation in due time. LOUIS BAUER, M. D., M. R. C. S., Eng., Professor of Surgery in and Dean of College of Physicians and Surgeons, St. Louis, Mo.

HORSFORD'S ACID PHOSPHATE IN CHRONIC CATARRH OF THE STOMACH.

INDIANAPOLIS, IND., *Jan.* 6, 1880.

I prescribed one bottle of Horsford's Acid Phosphate several months since, in a case of chronic catarrh of the stomach, complicated with a strumous diathesis of long standing, and to my utter astonishment he has improved every day since.

D. H. PRUNK, M. D.

ST. LOUIS, Mo

KENNEDY'S Compound Extract Pinus Canadensis received. It is the only astringent I use in the throat. I consider it a very valuable preparation. THOS. F. RUMBOLD, M D.

THE publishers of the JOURNAL have made a new "departure" this fall in offering a list of valuable premiums for new subscribers. Be sure and read the seventh advertising page carefully.

WE welcome to our columns this month an advertisement from "over the ocean." M. Emile Deiss, of Marseilles, is the manufacturer of a valuable chemical instrument, and invites correspondence.

PARTICULAR attention is invited to the announcement of Messrs. Frothingham & Underhill, on the first page Physicians who have long felt the need of a reliable article of Pepsine can now buy direct of the manufacturers.

THE only sure way to prevent sea-sickness is to stay at home and the way to prevent disappointment in a pen is to use one of Esterbrook's

Boston Journal of Chemistry
AND
POPULAR SCIENCE REVIEW.

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Familiar Science.

THE GREAT COMET.

BY PROF. C. A. YOUNG.

We have been much favored lately in the matter of comets. According to the average course of things, we are entitled to expect a naked-eye comet only about once in seven years; but since 1880 we have had five, — three of them of the first rank.

The one now disappearing is among the most interesting on record. It seems to have been first discovered on or before September 7th, at Cordova, by Dr. Gould, or one of his assistants. On the 8th it was noticed by Finlay at the Cape of Good Hope, and four days later at Rio, by Cruls, who telegraphed the news to Europe. On the 17th it came to its perihelion, passing within 300,000 miles of the sun's surface; and about an hour and a half before this event the Cape observers actually saw it, with their telescopes, suddenly disappear at the edge of the sun, — an unprecedented observation. A little earlier in the day it had been independently found by Mr. Common in England; and on the 18th it was so conspicuous in the full glare of noon as to be discovered by hundreds of casual observers in all parts of the world.

It continued for three or four days to be visible by daylight, and then was lost sight of for a little while, until it had receded far enough toward the west to be seen before sunrise. During the early part of October it was a magnificent object, with a head rivalling Jupiter, and a tail, extraordinarily dense and brilliant, extending some 15° or 20°, and really about 50 millions of miles in length.

On September 18th the comet was observed with the spectroscope by Thollon at Nice. The carbon bands of the ordinary comet spectrum could not then be made out in the glare of sunlight, but the continuous spectrum of the nucleus was distinctly visible, and upon it the characteristic D lines of sodium were conspicuous and bright. These lines had first been observed in a cometary spectrum only a few weeks before, — in the spectrum of Wells's comet. In the present case, they were much more brilliant, and were strongly displaced toward the red, — as they ought to be, since the comet was then rapidly receding from the earth. As late as October 4th they were still faintly visible, but after that date the spectrum was simply that of ordinary comets, identical with the spectrum of the blue portion at the base of a candle flame.

On September 19th the comet, to the naked eye, looked like a small, bright-winged bird flying toward the sun. With the telescope its head was seen to be a brilliant but ill-defined nucleus, and the wings were curved streams of light, pouring backward to form the tail. As seen at Princeton these two jets crossed each other just in front of the nucleus, and a third fainter arc of light was visible in front of them. The whole appearance was much like that of Coggia's comet on July 13, 1874, as figured by Brodie in the frontispiece of Chambers' "Descriptive Astronomy."

On October 2d, when the writer first examined it with the great 23-inch equatorial, the nucleus was egg-shaped, followed by the usual dark stripe along the axis of the tail, and with one well-formed envelope in front, and traces of others. On the 4th the nucleus had lengthened out into the form of an Indian club; the envelope had degenerated into a diffuse cloud without outlines, and the dark stripe was less distinct. On the 10th the dark stripe had nearly disappeared, but along one of its edges, a *bright* streak had formed, and this in a few days obliterated and replaced the dark one. The nucleus on the 10th had become a long irregular streak, made up of six or eight knots of light, veiled and connected by a less brilliant nebulosity. These knots were arranged along a slightly broken line some 45″ or 40,000 miles in length, the largest and brightest being about one third of the way from the forward end. This, which was probably the true nucleus, was perhaps 2000 miles in diameter, and was separated from the next one by a considerable interval; so that, with a small telescope, or after the advancing dawn had drowned out the faint connecting nebulosity, the nucleus seemed to be cut in two at this point. No other comet has ever been known to present a nucleus of this peculiar lengthened form, and it will be a matter of interest to observe whether this characteristic, which still persists (November 4th), will continue till the comet is lost sight of. It unfortunately very much diminishes the precision attainable in observing the comet's place.

The comet has also exhibited another unexampled phenomenon. On or about October 9th, there was thrown off *toward* the sun a faint streamer of light; not a mere jet from the nucleus (which is not uncommon), but a band of considerable width. On the 15th, when the streamer was brightest, it was about half a degree wide, originating in the tail a degree or two above the nucleus, and extending downward toward the sun some 4° below the nucleus. The edges were pretty well defined and nearly parallel, and the brightness was fairly uniform until near the lower end, where it faded out gradually. It disappeared a few days later.

On October 8th, Schmidt of Athens, announced the discovery of a companion comet 4° southwest of the great comet; and about the 15th Mr. Brooks reported either the same, or another one some 8° to the east. They must have been faint objects, as no other observations of them have come to the knowledge of the writer. They were looked for carefully at Washington, Princeton, and presumably elsewhere, but not found.

The chief interest of the comet lies, however, in its orbit, in its close approach to the sun, and the question of a probable collision between it and the sun at no very distant date.

On September 17th it passed within less than 750,000 miles of the sun's centre, and hardly 300,000 miles above its surface, rushing through the coronal regions with a velocity exceeding 300 miles a second, and completing 180° of its orbit in three hours and a half.

Thus far only four other cases are on record of so close an approach to the sun; and one of those is uncertain. In 1668 a comet was observed (for three weeks only) with a path so peculiar that its motions are fairly represented by either of two widely different orbits; and there is now no means of determining which is correct. According to one of these orbits, the one which is most generally accepted, the perihelion distance of this comet was only 450,000 miles. The comet of 1680 had a perihelion distance of 575,000 miles; the comet of 1843, 512,000; the comet of 1880, about 550,000; while that of the present one is 750,000, as has been said.

Now the remarkable thing is that the orbits of all these comets (excepting only the comet of 1680) are closely alike. The planes and direction of motion are practically identical, and the major axes of all four lie in the same direction. These comets have all come toward our sun from one region of the heavens, in the neighborhood of the great star Sirius.

Probably, then, there is some connection between them; and the simplest hypothesis, accepted by many of our eminent astronomers, is that they are really one and the same body, observed at successive returns. Still, this is not necessarily the case, and many others, equally eminent

hold the view that there must be more than one of them, and that we have to do with different members of what may be called a *family* of comets; of common origin very likely, and perhaps derived from some ancient disruption of a single parent comet, like that which happened to Biela's comet in 1846.

The difficulty of admitting their identity lies in the fact that the computed orbits for the comets of 1880 and 1882 indicate periodic times inconsistent with the theory. As to the comet of 1668, the data are insufficient. As to the comet of 1843, nothing is known inconsistent with the idea that it may be a return of the comet of 1668. As regards the comet of 1880, the elaborate calculations of Meyer, of Geneva, make it highly probable that *it* was a return of the comet of 1843. Not only do the elements agree in a general way, but Meyer also finds for the comet of 1880 a period of almost thirty-seven years, and shows that the observations could not be reconciled with a period less than thirty or more than fifty years. So far, then, the "identifiers" have things their own way. But when we come to the present comet it is different. In the first place, Meyer's calculations regarding the 1880 comet were all based on observations made while the comet was receding from the sun, and on account of the inclination of its orbit the comet has since been quite beyond the influence of any great disturbances. No reason, therefore, can be assigned for a shortening of its period to less than three years since 1880. Then, again, the calculations of Chandler, Wendell, and others show that the present comet, since its perihelion passage, has been moving in a nearly parabolic orbit, the observations being quite irreconcilable with an eccentricity as small as .996, which would correspond to a period of three years. The case is strengthened also by the fact that Mr. Finlay's observation, nine days before perihelion, agrees well with the orbit computed by Mr. Chandler from the later observations. It may be added that the difference between the perihelion distances of the comets of 1880 and 1882 (550,000 and 750,000 miles respectively) is so large as to be another serious objection to their identity. Taking all things into account, the writer feels pretty certain, therefore, that these two comets are not the same, but a pair of twins.

It need hardly be said that, if these conclusions are valid, the comet cannot return in six months and plunge into the sun. Not that the speculations of Mr. Proctor and others who have taken the same view have anything *absurd* about them. *If* the observations of the comet of 1880 admitted the possibility of a return in three years, and *if* the observations of the present comet indicated any considerable ellipticity of orbit, one would have to admit their conclusions. If ever a comet actually experiences any considerable resistance in the solar atmosphere, its fate is sealed, and it must ultimately fall upon the sun in the way these writers have indicated.

As to the effect of such a fall, it is not likely to be in any way disastrous to the earth. Undoubtedly, the energy of the comet's motion would be converted into heat, and if the sun were a cold and solid or even liquid mass there would be a sudden rise of temperature and radiation, which might be enormous if the colliding mass were large. Constituted as the sun is, however, the effect of a body plunging through the photosphere into its gaseous core would probably be mainly felt as expansion, without much change of external temperature or radiating power. Somewhat as urging a fire under a kettle makes the water no hotter, but only makes it boil faster, so the introduction of fresh energy into the sun's mass would merely return it to the condition it had a few days or years ago, by replacing what it had lost in the mean time.

There might, and very likely would, be interesting and brilliant phenomena accompanying the rush of the comet through the chromosphere; but so minute is a comet's mass that it is hardly possible that any damage could result to anything but the comet itself.

LESSONS FROM A LAMP FLAME.

Of the many objects we see in every-day life, few can afford us more scientific information than the burning of an ordinary coal-oil lamp. The younger readers of the JOURNAL, if no others, may be willing to spend a little time in noting the facts illustrated by our lamp while burning.

HOW THE OIL ASCENDS.

Your lamp is before you, filled with coal oil, which is composed of carbon and hydrogen. Examine the summit of the wick, and you will observe that the particles of oil have reached it, though the oil is only half-way up the side of the lamp. A force known as *capillary attraction* has been silently at work since the oil was poured into the lamp. Slowly, but surely, the molecules of oil have been crossing the minute meshes of the wick, led on by attraction, until they have finally reached the top of the network, where they will remain, until an increase of temperature takes place, which will enable them to pass off into the atmosphere, into another form.

INCREASE OF TEMPERATURE NECESSARY TO PRODUCE FLAME.

With these atoms of carbon and hydrogen another element must be combined before combustion takes place: that element is *oxygen*. Coal oil cannot burn of itself. If it could, we should be unable to smother it, as is often done. Smothering a flame is, in reality, shutting off the oxygen supplied by the presence of the air. As the air contains about twenty per cent. of oxygen, it furnishes this third element, and you have now at the summit of the wick three elements — carbon, hydrogen, and oxygen — ready for chemical union. Increase of temperature will set the atoms to work. There are various means by which you might get this heat, but probably the most convenient is that which is generally employed, — a common match. Take one, give it a quick rub upon something; it takes fire. Apply it to your lamp; the oil, in turn, is ignited, and a beautiful flame appears before you.

In rubbing the match, you were doing the very thing which was required to get your wick ignited, — increasing temperature. In this case a little friction did the work, because the end of your match was covered with a mixture containing a very inflammable substance, called phosphorus. You will find that in all cases increase of temperature precedes ignition, whether it be in the stove or in a pile of oily wool. The elements in all are alike undergoing oxidation, — that is, union with the oxygen of the air; and when this union is accelerated, so that much heat is evolved, the whole bursts into flame.

WATER PASSING FROM FLAME.

Now return to the lamp, which is steadily manufacturing *water* and *carbonic acid*, and bringing about two great chemical changes. If you have any doubt of this, verify the statement by experiment.

Take a piece of clean glass, hold it over the flame, and you will perceive drops of *water* almost immediately collect upon it. The proof is simple, for you have seen it repeated many a time when a chimney is put upon the lamp.

CARBONIC ACID FROM FLAME.

To test the presence of *carbonic acid* passing from the flame, the experiment is more complicated.

Take an ordinary clay pipe, hold the bowl mouth downwards, pretty well over the flame, and you will notice gas almost immediately issuing from the stem. Place a lighted match in this gas, and it goes out; try it again, and another failure. Your match cannot burn there, for a great enemy to combustion is passing from the flame up the tube; that enemy is *carbonic acid*, which extinguishes flame. Were you to inhale this gas, it would stop the process of combustion going on in your body, and cause death, just as it terminates the life of your flame. The burning of a lamp and the heating process in animal life are dependent on the same principle, that of oxidation, the union of oxygen with the elements of which they are composed.

The passage of carbonic acid from the flame may be further shown by taking a little lime water (water mixed with lime and then filtered) and a glass tube shaped so as to enable you to lead the gas issuing from the flame through the water. As the gas passes into the water the liquid assumes a milk-white color, and particles like grains of chalk, accumulate on the bottom of the vessel. The sediment collecting is *calcium carbonate*, usually called carbonate of lime, and has the same composition as chalk, which is made up of carbonic acid and lime. In this case, we have the compound formed from the union of the lime in the water with the carbonic acid passing through it. From the preceding experiments it is readily seen that the lamp, while burning, is manufacturing water and carbonic acid gas, both of which are passing into the atmosphere.

INDESTRUCTIBILITY OF MATTER.

The *carbonic acid* has been formed from the union of the *carbon* in the oil with *oxygen* of the air, and the *water* from a union of the *hydrogen* of the oil with the same element. Here the fact that matter is indestructible presents itself. Matter may change its form, but nothing is lost. The carbonic acid from our coal fires this winter will feed vegetation next summer, and in ages to come may find itself again purged by fire, and passing into space. Nothing is lost; the atoms created with our globe are still on or about it, combined in some form. True, they may have passed through thousands of changes, but, taken together, they number the same.

You have been watching the *action* of the

flame; now observe, for a little, its *appearance*. The centre seems quite black, while the portion above appears yellow, and the border blue below, changing to a pinkish hue upward along the edge. Flame, then, consists of three parts: the dark centre, the bright luminous portion, and the pinkish edge.

ALL FLAME HOLLOW.

The dark centre is not flame at all; it is hollow, for as soon as you lit the lamp a flaming envelope was formed, which shut off the oxygen of the air from the atoms of carbon and hydrogen issuing from the wick. On that account they cannot ignite until, moving around in the luminous space, they finally reach the edge, where true combustion is going on. To confirm this by experiment, —

(1.) Take a piece of white paper; hold it a moment about half-way down the flame, but do not allow it to ignite. On withdrawing it, you will observe a scorched circle, showing the flame to be hollow.

(2.) Take a small piece of fine wire gauze, hold it over the flame, and gradually bring it down; the flame appears to be getting smothered, and seems as if the top had been cut off. Examine it from above, and you will notice at once that the flame is hollow.

THE CENTRE OF THE FLAME IS UNCONSUMED GAS.

(1.) Take a small tube (not necessarily glass), put one end well into the centre of the dark portion of the flame, and the gas ascends. As it issues from the tube, apply a light; it immediately ignites, showing that there is unconsumed gas at the centre.

(2.) Take the piece of wire gauze used previously, and make a hole in it large enough to let a match pass through it. Bring the gauze down gradually over the flame, and through the opening prepared in it push a match into the wick, so that it will stand about a quarter of an inch above the summit of the wick. Raise the sieve, taking care not to disturb the flame. There, in the very centre of the flame the match stands unconsumed, no trace of ignition appearing. By replacing the sieve the match may be withdrawn, and found to be not at all, or but slightly, affected. From the preceding simple, but very instructive experiments, you will be quite prepared to admit that lamp flame is hollow, that the gas within is unconsumed, and that this portion may be very appropriately called the *area of non-combustion*.

LIGHT OF FLAME DUE TO INCANDESCENCE OF PARTICLES OF CARBON.

Examine a higher region in your dome-like flame, and glean something from the luminous zone. Here minute particles of *carbon* are floating about, strongly heated and giving light to the flame. Were they completely consumed, you would notice a great diminution in the light and an increase of heat. (Compare the light and heat evolved from burning alcohol and coal oil.) On placing a cold substance in this zone, it at once becomes covered with something like lampblack; it is lampblack manufactured on a small scale.

The glowing heat, or *incandescence*, of these particles has been giving luminosity to the flame. On passing air or oxygen into this part of the flame, you will notice less light and more heat, for the carbon is more completely consumed. Shutting off and admitting air into a Bunsen burner illustrates distinctly the nature of the luminous zone of flame by alternately increasing and decreasing its light. This part may be well termed the *area of incomplete combustion*.

THE HOTTEST PART OF FLAME.

We have reached the border of the flame. Here real union takes place between the oxygen of the air, and the elements of which the coal oil is composed; and this is accompanied by a much higher temperature than was observed in the preceding areas. Water and carbonic acid, as already shown, are passing off.

The intense heat in this part of the flame shows that complete union of the elements is taking place, and that the name *area of complete combustion* may suitably be applied to it. Summing up our observations on lamp flame, we conclude.

(1.) Flame does not appear until a certain temperature is attained.

(2.) Water and carbonic acid are passing from the flame.

(3.) Matter is not destroyed during combustion, but only changes form.

(4.) Flame is hollow.

(5.) Flame consists of three parts: (*a.*) Area of non-combustion (dark). (*b.*) Area of incomplete combustion (yellow). (*c.*) Area of complete combustion (pinkish).

THE DECAY OF WORLDS.

THE abstracts of Dr. Winchell's popular lectures at Martha's Vineyard, which we have already published, have been received with so much favor by our friends that another of the series will doubtless be welcome for the present month: —

Every world, whether sun, planet, or satellite, has its appointed life-time. By the arrangement of nature, a certain cycle of conditions must be completed, and the body has then reached a state of cosmical death. Our own planet is in the midst of visible changes, which carry it continually toward some finality which must constitute an end of the present terrestrial order. What we witness of terrestrial changes belongs to the planetary stage of cosmical being; but on a grander scale the other planets, and even the suns in the firmament, reveal the progress of a cycle of events which involves every cosmical body in the visible universe.

Let us glance at some terrestrial changes and endeavor to interpret them. The little road-side rill, which hurries with its load of sediments to some lower level, is carrying away some of the substance of the highway and of the contiguous field. Every summer shower removes some of the soil from the farmer's lands, and diminishes their value for arable purposes. The rivers of the world are charged with sediments filched from the land. The great "bar" at the mouth of the Mississippi is composed of materials brought down from all the uplands drained by the great river and its tributaries. The bar extends itself 330 feet annually into the deeper waters of the Gulf. The broad valley of the Amazon has been built up by the annual overflow of the great river. The Nile, the Ganges, and the other great rivers of the world are performing similar work. An inevitable wastage of the continents is in progress. They are lowering at a rate which some geologists have attempted to estimate and express in figures. We are thus compelled to contemplate the time when the land will have been transported into the sea. When the land shall have been lowered to the present sea level, the water will cover the land 300 feet deep. Such an eventuality will end the present terrestrial order, — if indeed the destruction of the soil shall not have reached that finality at an earlier period.

We have heretofore noted the evidences of a process of cooling. The world beneath our feet is growing cold. The time is approaching when no warmth will remain of all that store of heat which once lighted our planet to a state of incandescence. Undoubtedly the loss of the world's inherent heat will exert an important influence on the population which occupy its surface. But a juncture of greater significance will arrive. The waters which belong to the earth percolate through the rocks and saturate the crust to a certain depth. At that depth the heat of the world's interior is such that water is converted into vapor and returned towards the surface. With progressive cooling and progressive thickening of the cold crust, the volume of water required to fill the pores will continually increase. When the earth is cooled to the centre, the waters of the ocean will not be sufficient to satisfy them. The ocean will be drunk up. A cold crust nine hundred miles thick will absorb all the water belonging to our planet. Indeed, the atmosphere will follow the ocean in progress of retirement into the pores of a cold world, and the time must come when water and air will both be absent from the surface of our globe. Then the earth will have reached a stage which is *a present reality* in the life of our moon; for our satellite gives no sign of air or water, and hangs suspended in the heavens, simply a fossil world, unfolding its "nightly tale" of events impending over the future history of our own world.

What shall prevent the fires of the sun from dying out? Is there any heat so intense, or any mass of heated matter so vast, that time will not suffice to exhaust its force? The earth was once a sun; the moon was once a sun. The radiation which has reduced them from a solar temperature will bring dimness and feebleness to the powers of the great sun of our system. There is no process known by which the heat and light of the sun are perpetuated. The great source of warmth for the generations of animals and plants must inevitably become exhausted, and the sun will stand "blind and blackening" in the midst of space. Then will winter and midnight reign throughout the solar system.

There are other symptoms of decay. A subtile ether pervades all the bounds of space. Light comes to us from the remotest star, borne on the quick vibrations of this ethereal fluid. This is a material medium. Space, therefore, is not a vacuum, as Laplace assumed. The filmy comet on its way around the sun experiences a resistance, the final consequence of which is to give centripetal force the advantage, to bring the comet nearer the sun and accelerate its motion. The comet is destined to be precipitated upon the sun. In a similar way, but in diminished degree, every planet of our system is made to approach the sun. In the distant ages each planet in succession will return to the bosom of its ancient mother, from whose presence each went forth in early youth with all the gayety of a bride. The sun may already have grown cold, and each recurring collision may develop sufficient heat to re-illume the dead mass; but time will suffice for any finite supply of heat to be wasted. The vast central conglomeration of solar and planetary matter will remain a dark and motionless corse. We are unable to trace the action of the forces of matter farther. If ever the dead mass is again excited to the activity of the

early ages of the cosmic cycle now closed, some omnific arm must be outstretched to awaken it to renewed life.

We have traced the round of vicissitudes within the circuit of one system. We lift our eyes to the stars, and behold the fields of infinite space strewn with similar systems in some stage of a similar progress. The nebulæ are other realms of fire-mist, in which suns and planets exist in embryo. Their spiral and annular forms mark early stages in the process of evolution. Saturn's rings preserve for us actual examples of the ring condition. Here are rings which the disturbances of neighboring bodies did not disrupt, but rather held balanced between contending forces, until fire-mist cooled to a dust of solid matter. The gradation of starry colors betokens a gradation in starry temperatures. White stars, yellow, red, variable, and "temporary" stars, mark so many progressive stages in a process of cooling which embraces all worlds. Jupiter has attained the stormy stage. Our world, more advanced, is in its habitable phase. Mars is growing senescent. The moon is already tenantless and dead.

From beginning to end of this series we trace a continuity. *One history* characterizes all the worlds of space. *One empire* embraces all cosmic existence — one principle of gravitation, one ethereal medium, one system of material laws. The government which reveals such unity in space and time can only be a government administered by *One Mind*.

KEPLER AND THE CAMERA OBSCURA.

A CORRESPONDENT of the *Springfield Republican*, referring to Sir Thomas Wotton's works, says: —

There is a letter from Wotton to Lord Bacon in 1620, which contains the earliest English account, as I suppose, of the camera obscura, and the man using it was the great astronomer, Kepler. Wotton says, "I lay a night at Lintz, the metropolis of the higher Austria. There I found Kepler, a man famous in the sciences, as your lordship knows, to whom I purpose to convey one of your books that he may see we have some of our own that can honor our king, as well as he hath done with his Harmonica. In this man's study I was much taken with the draught of a landskip on a piece of paper, methought masterly done; whereof inquiring the author, he bewrayed with a smile, it was himself; adding he had done it, 'not as an artist, but a mathematician.' This set me on fire. At last he told me how. He hath a little black tent (of what stuff is not much importing) which he can suddenly set up where he will in a field, and it is convertible, like a windmill, to all quarters at pleasure; capable of not much more than one man, as I conceive, and at no great ease, perhaps; exactly close and dark, save at one hole about an inch and a half in the diameter, to which he applies a long perspective trunk, with a convex glass fitted to the said hole, and the concave taken out at the other end, which extended to about the middle of this erected tent. Through which the visible radiations of all the objects without are intromitted, falling upon a paper which is accommodated to receive them; and so he traceth them with his pen in their natural appearance, turning his little tent round by degrees, till he hath designed the whole aspect of the field. This I have described to your lordship, because I think there might be good use made of it for chorography; for otherwise, to make landskips by it were illiberal; though surely no painter can do them so precisely." Is not this an interesting anecdote about Kepler?

Two hundred and forty-four earthquakes, it is stated, are known to have occurred during 1881, of which eighty-six were in winter, sixty-one in autumn, fifty-six in spring, and forty-one in summer.

SCIENTIFIC BREVITIES.

DESIGNS ON GLASS. — The following is an ingenious method of obtaining mirror-like designs on glass, devised by Leclerc: The glass, having been silvered by the chemical process, is coated with a thin and uniform layer of sensitive bitumen, and this is exposed under a transparency. The next step is to wash away the unaltered bitumen with oil of turpentine, so as to leave the bituminous design on the silvered glass. The application of moderately strong nitric acid removes the silver, excepting where it has been protected by the bitumen, so that the metallic design shows like a mirror from the reverse side of the glass. The plate may be backed by paint or any other suitable material.

THE TELEPHONE IN THE SANDWICH ISLANDS. — The telephone system is now developed to a large extent in Honolulu. A net-work of wires covers the island, and in the principal town, which has only 14,000 inhabitants, 230 private houses are connected telephonically. The monthly charge to subscribers is only a few dollars, and yet the contractor, who is a German, makes a pretty large income. His intention is to connect the whole archipelago by wire.

We shall expect to hear next that the "King of the Cannibal Islands" orders his roast missionary by telephone, and lights his hut with Edison lamps or Jablochkoff candles.

OXALIC ACID FROM WASTE PRODUCTS. — Some French chemists have succeeded in obtaining oxalic acid from the waste of shoemakers' and saddlers' shops, and others where leather is used; also from woollen rags, horn, hair, etc. For this purpose these residues are treated with one part of sulphuric acid and four of water, and the mass thus obtained a subjected to the action of one part of nitric acid and three of water, at a temperature of about 80° C. From the digestion of this oxalic acid is easily extracted.

ELECTRIC LIGHTING AT SOUTH KENSINGTON. — The substitution of electric lighting, by the aid of two machines driven by one engine, in the place of gas, at the South Kensington Museum has resulted in a saving in the working expenses at the rate of nearly $3700 a year, or more than $112 per annum for each lamp.

IN THE DEPTHS.

SUBMARINE WORK. — Thanks to the enterprise of an English firm, the submarine diver of the future is likely to have all the advantages which Jules Verne gave to the divers in his wonderful work, "Twenty Thousand Leagues under the Sea." Our readers will remember that there the divers are represented by the author as putting on their armor in the usual fashion, and then attaching oxygen reservoirs at the back; going into the water free and independent of air-pumps and heavy-dragging air-pipes. The new system calls for the manufacture of oxygen, and its compression into tanks, which are strapped upon the armor. The carbonic acid of the breath is removed by means of caustic potash, and a fresh supply of oxygen takes the place of that used up by breathing. The diver is of course entirely independent of the surface, and can walk about as much at his ease as it is possible beneath the surface of the water, weighted by the usual amount of lead necessary to keep him submerged.

THE ELECTRIC LIGHT FOR SUBMARINE USE. — The electric light is likely to render valuable service in submarine operations, as in examination of wrecks, etc. According to *La Lumière Electrique*, the apparatus giving the best results is that devised by M. Bazin. A powerful regulator is inclosed in a cylinder having a glass plate below and a reflector above, which gives bright illumination of a circular space at least 30 meters in diameter, but the light extends much further. The spectacle presented in these circumstances is said to be remarkably fine.

Practical Chemistry and the Arts.

THE ELECTRIC LIGHT AND GAS.

THE British Association for the Advancement of Science held its meeting for the present year at Southampton, under the presidency of Dr. Siemens. In the cousre of his address, which was in great part devoted to the developments of electricity, he said: —

"It can no longer be a matter of reasonable doubt that electric lighting will take its place as a public illuminant, and that, even though its cost should be found greater than that of gas, it will be preferred for the lighting of drawing-rooms and dining-rooms, theatres and concert-rooms, museums, churches, warehouses, show-rooms, printing establishments, and factories, and also the cabins and engine-rooms of passenger steamers. In the cheaper and more powerful form of the arc light it has proved itself superior to any other illuminant for spreading artificial daylight over the large areas of harbors, railway stations, and the sites of public works."

Having pointed out that the electric light may be worked by natural sources of power, such as waterfalls, the tidal wave, or the wind, he proceeded: —

"Assuming the cost of electric light to be practically the same as gas, the preference for one or other will in each application be decided upon grounds of relative convenience, but I venture to think that gas-lighting will hold its own as the poor man's friend. Gas is an institution of the utmost value to the artisan; it requires hardly any attention, is supplied upon regulated terms, and gives with what should be a cheerful light a genial warmth, which often saves the lighting of a fire. The time is, moreover, not far distant, I venture to think, when both rich and poor will largely resort to gas as the most convenient, the cleanest, and the cheapest of heating agents, and when raw coal will be seen only at the colliery or the gas-works. The annual cost of the coal used for making gas is about £5,400,000; but the by-products derived from it, in addition to the gas, — namely, coloring matters, ammonia, pitch, creosote, crude carbolic acid, coke, — are worth £8,370,000, or nearly £3,000,000 more than the coal costs."

He next showed that in using coal for heating purposes these valuable products are not only absolutely lost, but in their stead we are afflicted with those semi-gaseous by-products in the atmosphere too well known as smoke. He added: —

"The hurtful influence of smoke upon public health, the great personal discomfort to which it gives rise, and the vast expense it indirectly causes through the destruction of our monuments, pictures, furniture, and apparel are now being recognized. As is evinced by the success of recent smoke abatement exhibitions. The most effectual remedy would result from a general recognition of the fact that wherever smoke is produced fuel is being consumed wastefully, and that all our calorific effects, from the largest down to the domestic fire, can be realized more completely and more economically without allowing any of the fuel employed to reach the atmosphere unburnt. This most desirable result may be effected by the use of gas for all heating purposes, with or without the addition of coke or anthracite. Experiments made in Paris show that gas can be made for heating purposes much cheaper than it is now supplied, and its consumption would probably increase tenfold if it were obtainable separately for heating at say 1*s*. [25 cents] per 1000 cubic feet. At this price it would be, not only the cleanest and most convenient, but also the cheapest form of fuel; and the enormous increase of consumption, the superior

quality of the illuminating gas obtained by selection and the proportionate increase of by-products would amply compensate the gas company or corporation for the comparatively low price of the heating gas."

Dr. Siemens considered that the adoption of gas engines for propelling vessels and the advent of the dynamo-machine would mark an era of material progress at least equal to that produced by the introduction of steam power.

Apropos of this subject, a New York journalist, who has been "interviewing" a certain "eminent electrician," remarks: —

Our attention was called to one point, the result of the experience of the electric-light interest, which we believe has not yet been brought to the notice of the public, and which nevertheless has an important bearing on the question. Much significance has been attached to the fact that, for instance, in this city a number of our most prominent thoroughfares have been illuminated by the electric light, and great damage to the interest of the gas companies has been predicted. Now, curiously, the very reverse has taken place. It is a fact that for every street lamp there are many times as many jets burning in private dwellings and stores along the line. The occupants, coming from the strongly illuminated street, have a desire for much more light than they formerly considered sufficient for their purposes, and the result is that the consumption of gas in houses along thoroughfares lighted by gas is now not alone so much larger as to compensate for the loss on the street, but very much greater. The gas companies would now probably be anxious to have all the thoroughfares of our great city blaze with the electric light, as at present they do, and can feel secure of holding the great domestic consumption in a firm grasp. Whatever future progress in incandescent electric lighting may bring to change the relations between the two rivals for lighting our dwellings, there is no doubt that until now gas still holds sway.

MEMORANDA IN THE ARTS.

Artificial Cloves. — The *Madras Mail* says that several bags of cloves received in London from Zanzibar were lately found, on arrival, to contain artificial cloves, neatly manufactured by machinery, instead of the real spice. The cloves were made of soft deal, stained a dark color, and soaked in a solution of essence of cloves to give them the required scent. They were traced as having been imported into Zanzibar from America. Did they come from Connecticut, like the wooden nutmegs?

A New Imitation Ivory. — One of the disadvantages of celluloid is the fact that it burns very readily when a flame is applied, but a new compound, said to be fireproof, and suitable as a substitute for ivory, is thus made: A solution is prepared of 200 parts of casein in 50 parts of ammonia and 400 of water, or 150 parts of albumen in 400 of water. To the solution the following are added: quicklime, 240 parts; acetate of alumina, 150 parts; alum, 50 parts; sulphate of lime, 1200 parts; oil, 100 parts. The oil is to be mixed in the last. When dark objects are to be made, from 75 to 100 parts of tannin are substituted for the acetate of alumina. When the mixture has been well kneaded together, and made into a smooth paste, it is passed through rollers to form plates of the desired shape. These are dried and pressed into metallic moulds previously heated, or they may be reduced to a very fine powder which is introduced into heated moulds and submitted to strong pressure. The objects are afterwards dipped into the following bath: water, 100 parts; white glue, 6 parts; phosphoric acid, 10 parts. Finally, they are dried, polished, and varnished with shellac.

Discoid Projectiles for Cannon. — Before the adoption of rifled cannon with oblong projectiles, several eminent artillerists conceived the idea that good effects might be obtained with a disc-shaped projectile, having a rotation about its axis of figure, and fired so as to present its equatorial surface to the air. Experiments were indeed made in France, not very long ago, with a portable arm and discoid projectiles. The chief advantages hoped for were diminished air resistance, great stability of the axis of rotation, and consequent accuracy, penetrating power, etc. As these advantages were largely had with oblong projectiles, the matter dropped. In the *Revue d'Artillerie*, however, Captain Chapel has lately called attention to a new property of these discoid projectiles, and thinks it might, in some cases, prove valuable. This is a tendency, in the descending path, *to return*, and to strike the ground at an angle above 90°. In this way, artillery placed opposite a line of defence would be able to strike the defenders from behind, and the ordinary methods of defence would require modification.

A New Material for Cans, etc. — Leatheroid is a new article which is being made of paper. It consists of a number of thicknesses of cotton paper wound one upon another over a cylinder. The remarkable qualities of strength and adhesion it possesses are derived from a chemical bath, through which the paper is drawn on its way to the cylinder. The effect of the chemical bath on the paper is said to be wonderful. Leatheroid, for the purposes it now serves, consists of about twenty thicknesses of paper; it is shaped upon or around moulds, while wet, into the form it is to represent, and will hold that form perpetually when dry. When dried it is as difficult as rawhide to cut with a knife. A company has been formed at Kennebunk, Me., for the manufacture of this article, and will at once build a large mill there for that purpose. This company is making, for introduction into the mills, roving cans, boxes, etc., to take the place of tin cans and wooden boxes. Cans made from this material are about one fourth the weight of tin cans of equal size; while tin cans are liable to get bent, cans made from leatheroid are entirely free from this objection. They have the elasticity of thin steel, and no amount of kicking or hauling will break them.

The Great Wall of China. — An American engineer, who, being engaged in the construction of a railway in China, has had unusually favorable opportunities of examining the famous Great Wall, built to obstruct the incursions of the Tartars, gives the following account of this wonderful work: The wall is 1728 miles long, 18 feet wide, and 15 feet thick at the top. The foundation, throughout, is of solid granite, the remainder of compact masonry. At intervals of between 200 and 300 yards towers rise up, 25 to 30 feet high, and 24 feet in diameter. On the top of the wall, and on both sides of it, are masonry parapets, to enable the defenders to pass unseen from one tower to another. The wall itself is carried from point to point in a perfectly straight line, across valleys and plains and over hills, without the slightest regard to the configuration of the ground; sometimes plunging down into abysses a thousand feet deep. Brooks and rivers are bridged over by the wall, while on both banks of larger streams strong flanking towers are placed.

Cleaning Watches. — The *Pharm. Zeitung* says that a watch, with the case open, laid in a vessel and covered with benzine for about three hours, going meanwhile, will be perfectly cleaned after that time. The vessel should be covered with parchment paper, and before removing the watch should be lightly agitated. Afterwards, the watch should be laid again in benzine, to which a little petroleum oil has been added, to oil the works.

Objections to Circular Saws. — The French Association for Preventing Accidents from Machines (founded under the auspices of the Mulhouse Industrial Society) recommends, in its last report, the suppression of all circular saws in workshops, where practicable. The reasons given are: (1) circular saws are extremely dangerous for workmen; (2) they require much more force than other saws; (3) they cut a broader line, and, consequently, produce more waste. Their only advantage is their cheapness.

RAILWAY NOTES.

Deafness in Railway Employees. — Professor Moos, of Heidelberg, has been investigating the subject of causes and effects of deafness in railway employees, believing that many cases of accidents are not unfrequently attributable to a defect of hearing on the part of those in charge of trains. The professor quotes several medical authorities who have paid special attention to this subject. One of these, Dr. Jacoby, found that in 10½ years he was called upon to treat 20 out of 80 engineers for affections of the ear; of these, 5 suffered from unilateral affections of the labyrinth, while the remaining 15 presented lesions of the middle ear. Dr. Hartman, who is also quoted, is of the opinion that the fact that the drivers are often exposed to violent winds, severe cold, and pass through long tunnels should be taken into consideration, and that these causes are apt to produce a difficulty of hearing, which, however, is often only transitory. Professor Moos refers to several railway accidents which were evidently due to the defective hearing of both the engineer and fireman. He concludes that the hearing of engineers should be tested as carefully as their sight.

Engineering Slaughter. — Although human life is no longer ruthlessly sacrificed as it was wont to be under the Cæsars and Pharaohs, when they had engineering enterprises on a large scale in hand, still there is no great undertaking of the kind without its bill of mortality. In the building of the St. Gothard railway, in Switzerland, 310 workmen were killed, and 877 injured. In the tunnel alone 177 were killed on the spot, and 631 injured, of whom a number afterward died. The figures sound like the report of an engagement.

Railway Schools in Russia. — There are at present 33 railway schools in Russia to furnish capable native officials, etc., for the lines of the country. A short time ago it was impossible to find fairly-educated natives for the service, and even now half the locomotive drivers in Russia are German. Twenty years ago, for example, there were, on a stretch of only 25 miles, four station officials who could not read nor write, and had to employ a clerk for the purpose. These schools now furnish engineers, locomotive drivers, station officials, stokers, and telegraphists. The pupils are chiefly sons of railway and telegraph officials. The course is three years in length, and, in many cases, two years of probation are added. A one-year preparatory course is provided for those who, at the outset, can neither read nor write. Afterwards, the pupils must remain at least two years in the service of the railway whose schools they have attended. These schools are not yet beyond the experimental stage. One of the oldest of them (founded in 1872) has supplied 25 of its pupils to the railway service.

Heights Reached by Railways. — There are "elevated" railways besides the one so called in New York city. The road through the Black Forest, in Europe, rises to a height of 2550 feet; the Sœmmering, 2670 feet; the Caucasus, 2925 feet; the Saint Gothard to the tunnel, 3462 feet; the Brenner, 4101 feet; the Mont Cenis, 4014 feet; the North Pacific, 4956 feet; the Central Pacific, 6420 feet; the Union Pacific, 6939 feet; and finally the Andes railway attains a height of 14,307 feet.

Agriculture.

GYPSUM IN THE FIXATION OF AMMONIA.

In the last number of the JOURNAL, an article was presented which we translated from *Le Moniteur des Produits Chimiques*, by M. Baye, on the fixation of ammonia in manures by the use of certain salts. This brief paper is of unusual importance, and deserves special consideration.

It has long been a mooted question whether, in the use of a salt so permanent as gypsum, in connection with manures, double decomposition could occur, resulting in the fixation of ammonia, and thus preventing great loss in the storage of manures. We have long known from experiments upon manures that gypsum does undergo chemical change in the presence of free ammonia, or carbonate of ammonia, but there has been considerable obscurity resting upon the reactions, or upon the conditions under which the reactions occur. Our attention was called to the behavior of gypsum when brought in contact with organic matter, by observing in the mud around the door of a plaster-mill the presence of free ammonia. As the spillings of plaster increased, the evolution of ammonia diminished, and in the mud was found sulphate of ammonia, as a resultant salt. In an address upon agriculture, published twenty years ago, we gave the results of our researches upon plaster when brought into connection with humus and ammoniacal manures, and the experiments of M. Baye confirm our conclusions then reached. These results show that in mixtures and manures containing considerable quantities of free ammonia, or the carbonate, gypsum has the capability of fixing or changing into a stable salt more of the ammonia than either sulphate of potash, kainite kieserite, sulphate of magnesia, or chloride of potassium. In the case of gypsum, the double decomposition results in the formation of insoluble carbonates and soluble sulphates. Our experiments do not show such rapid reactions as those of M. Baye. He states that in a mixture of 10 per cent. carbonate of ammonia, gypsum fixed immediately over 53 per cent.; in twenty-four hours, 60 per cent.; in one hundred and twenty hours, 74 per cent. This rapidity of chemical change does not occur in fertilizing mixtures, as we have found by experiments. It requires from one to three weeks to fix the ammonia fully in a reeking manure heap, by the addition of plaster; and under some peculiar conditions, not well understood, a much longer time is required. In mixtures of powdered raw bone with ashes, there is a speedy and copious evolution of caustic ammonia, which must be promptly arrested to prevent loss. We have found that gypsum is the cheapest and best agent, upon the whole, to use, although it does not act promptly enough to prevent all loss. To every barrel of mixed ashes and bone dust should be added a peck of plaster at the time the mixture is made; and if it is to be kept long it should be put in barrels. We have sometimes used a very dilute solution of sulphuric acid. This is promptly effective, but it is a troublesome agent for farmers to handle.

Every farmer should keep by his manure pen a few barrels of plaster, and as often as once each week should strew over the contents a sprinkling of plaster, and this should continue during the entire winter in warm cellars.

MASSACHUSETTS EXPERIMENT STATION.

THE Board of Control of this institution met at the State House, in this city, on Thursday, November 9th, to hear the report of a committee appointed to present a plan of organization. The committee consisted of President Chadbourne, of the Agricultural College, Dr. James R. Nichols, and Hon. Theodore Lyman, of Brookline. The plan presented was accepted, and Professor C. A. Goessman, of Amherst, was appointed director of the station, and also chemist. Dr. Manly Miles, of the Houghton Farm, New York, was appointed Superintendent of stock and field experiments, and Professor Maynard of microscopy and cryptogamic botany. Work has already commenced at the institution at Amherst, and it is hoped that during the present winter it will be so far perfected in its arrangements as to be ready for active work in the spring.

COMPLIMENTARY.

THE *Home Farm*, an interesting and able agricultural journal, published at Augusta, and edited by Samuel L. Boardman, formerly secretary of the Board of Agriculture of Maine, remarks that, in the opinion of some of the farmers of his State, "Dr. Nichols, for his studies and publications in the realm of plant food and fertilization, deserves an imperishable statue of bronze erected on the soil of Maine." We thank the good farmers of Maine for the compliment, but the monument or monuments most agreeable to us would be heaps of golden corn, or ricks of timothy, the results of better tillage and more enlightened husbandry. We have done what we could to help farmers in their work, and it is a satisfaction to know that our labors, which have been cheerfully given, without any pecuniary consideration or hope of reward, have been appreciated.

JUMPING SEEDS.

WE are indebted to an esteemed correspondent for calling our attention to vol. x. of the *American Naturalist*, in which, page 216, is found a very interesting article on "jumping seeds." We learn from it that in 1876 Mr. C. V. Riley presented to the Academy of Science at St. Louis a seed of this kind, to which allusion was made in the last number of the JOURNAL, and explained the cause of its singular behavior. Its movements are due to a worm imprisoned in the seed, which resembles the common white apple worm, but is much smaller.

The egg is deposited upon the outer covering of the pod which holds the seed, and the larva eats through the shell into the seed, and plugs up the hole with a pellet of silk, so that the future moth, which will have no jaws to eat with, may escape from its prison. The developed worm holds to the lining of the seed, by its four prolegs, which have very strong hooks, and by drawing back its body and swaying it to each side knocks against the walls of the seed, giving it powerful jars and movements. Its head serves the same office as the bill of the woodpecker, tapping the sides of its cell, propelling it forward, or overturning it. The *Lepidopterous* larvæ alone have this curious habit.

The plant producing the seed is a low shrub or weed, and is called *Yerba de flecha*, or arrow-weed. It grows in Mexico, near San Diego, is very poisonous, and the seeds are found in pods, holding three or four together. Each of the seeds at maturity, in July or August, has the little worm inside, and the imprisonment continues for six or eight months, when the moth tears away the silk plug and escapes. Of course the curious jumps and other movements of the seed, so mysterious to the beholder, cease when the worm changes to the moth. The seed is lively for a period of about six months. It is well to have the explanation of movements which seem so inexplicable, as the possessors of the curiosity are unwilling to destroy it, by cutting it open, to learn regarding its inside mysteries. This is certainly one of the most curious freaks in nature, and well worthy of thought.

ANOTHER "SURE CURE" FOR THE POTATO DISEASE.

A RECENT Danish writer, as we learn from our foreign exchanges, has published a book in which he tells "how to overcome the potato disease." He believes that the attack proceeds from the leaf to the root by the spores from the attacking fungus, as they ripen, falling on the surface of the land, and thence finding their way through the usually thin separating coat of soil to the young tubers, to which they attach themselves. His remedy is to heap above the tubers a sufficiently thick moulding of earth to ward off the attack. He adds: —

"The ridges must also be sharply pitched at the top, by which device the rain-water partly flows down the sides of the ridge into the furrows between the rows, and thereby is, to some degree, prevented from performing its pernicious office of carrying the spores down to the tubers, and from affording the necessary moisture for the germination of the spores about the tubers. As, finally, as above stated, the potato-vines are conductors of the rain-water, and, besides, make open passages through the earth down to the tubers, the potato-tops should be bent over to one side, so as to be in a reclining position, leaning over the adjoining furrow."

RURAL SUPERSTITION IN ENGLAND.

A WRITER in an English agricultural journal gives the following among other curious illustrations of the superstitions that still linger in the rural districts of Great Britain: —

One morning I met one of my neighbors leading a limping animal. "Well, neighbor Tom," said I, "what ails the mare?" "She 's sprained her leg," was the reply. "I suppose you 've been to the 'vet.' with her?" "No; I 've been to Mary o' the Moor to have the leg blessed." Farmer George (one of my men) told me one day he wished to be absent on the morrow as he had a journey to make; and on further conversation I found he was going somewhere to cure warts (or weybreds, as he called them) on cattle. "Well, Farmer George," said I, "and how do you cure them?" "I says something to 'um, and point at 'um." "And what do you charge for that?" "Oh! I don't charge anything, but they gives me what they like."

Then there are certain people among us who it is believed have the power of staunching the flow of blood from a wound by repeating some mysterious

words. Some are supposed to have an evil eye, and to be able to injure any person or beast by "casting" this evil eye on them. To others is attributed the power of "ill-wishing" their fellow-creatures, and so causing them inconvenience.

We once had an unfortunate litter of pigs which persevered in dying until only two out of ten were left. The cattleman's wife said she was sure an old witch who lived close by had "overlooked" them, and that the only way to save the rest was to cut the heart out of one of the departed suckers and burn it, which she did, and so the plague ceased. I did not hear of this until some time afterwards, so had not the pleasure of witnessing the ceremony, nor the interesting period when the change took place.

Another plan of spiting an enemy is to draw an imaginary circle round your victim; evil consequences, it is said, will certainly follow.

DIURNAL REST FOR PLANTS.

No one doubts that plants require periodical or annual rest, and up to the present time the necessity of diurnal rest has also been fully acknowledged, but it indicates the uncertainty of their convictions in such matters that botanists and physiologists now tacitly admit that the necessity of diurnal rest is an open question. The recent experiments with the electric light have led to this, but meanwhile gardeners will do well to hold on by Lindley, and others of the same school, who affirm that "diurnal repose is as necessary to plants as to animals." Should it be discovered that Lindley was wrong, we shall be prepared to believe anything afterwards, and doubt everything, in regard to plant life. Orchids living and growing without the old bulbs and the like would be nothing to the discovery that plants thrive as well without diurnal rest as with it, or that would involve changes in the physiological creed of the most momentous description. The report of the Paris experiments states that they afford no grounds for supposing that nocturnal rest is necessary to the assimilation of the food imbibed in the daytime," which may be true; but nothing has been more confidently asserted hitherto than that the organs of plants perform quite different functions during the day and night respectively. "The processes of assimilation are suspended; no digestion of food and conversion of it into organized matter takes place; and instead of decomposing carbonic acid by the extrication of oxygen, plants part with carbonic acid and rob the air of its oxygen." Changes that are going to completely upset this arrangement of nature must, it appears to common sense, exert a corresponding influence upon plant life, and produce changes something akin to what would happen if human beings were to begin to inhale carbonic acid instead of oxygen, and exhale the latter instead of the former. The changes suggested by the no-rest hypothesis in plant growth are strictly analogous to this.

SEEDS AND CUTTINGS.

SORREL. — Many farmers are greatly troubled with a growth of sorrel upon their lands, which is an indication of neglect and exhausted fertility. The weed, however, appears upon lands in good tilth in seasons when extreme drought prevails, or upon vicious dry ridges. The best way to exterminate the pest is to sow bone dust, mixed with ashes and plaster. One barrel of raw bone dust, with two of ashes and half a barrel of plaster, will serve to drive out the sorrel on a quarter of an acre of ground, if applied after deep ploughing.

A SCHOLARLY FARMER IN THE OLD ROMAN DAYS. — A farmer who has a taste for letters and makes good use of his leisure hours may become as good a scholar as his Roman brother, of whom Pliny the Younger writes thus to his friend Rufus: "Ah, how many learned men are withdrawn from notice by their own modesty or the quiet way they live! I write after a personal experience. Terentius the Younger, after a service in the cavalry, and having been procurator of Provence, very much to his credit, betook himself lately to his own estate, preferring a very retired life to the honors he might have had. I invited him to my table, looking on him as a good householder, a diligent husbandman; and I had my mouth made up to talk with him about the things I supposed he was interested in. In fact, I had begun, when he recalled me to literature by some remarks of the most learned cast. How well he talked! How good his Latin was, how remarkable his Greek! For he had both languages so much at command that he seemed to be best in whichever he spoke oftenest. What lots he has read! How much he remembers! You would think the good man was living at Athens, not in a farm-house. Well, well, he threw me into a great funk (*Quid multa? auxit solicitudinem meam*), and made me as afraid of these retired and rustic fellows, as of men whom I know to be very learned; and I advise you to be as careful as I am. For it is in our literature as in our Roman army: you will find a good many men, brought up in the country, who yet are armed at all points, and of the liveliest wit."

A SIMPLE AND CHEAP INSECTICIDE. — A correspondent of the London *Garden* says: I am using at the present time a decoction for the destruction of green and black aphides, thrips, and mealy bug on vines, which I find answers the end in view capitally, costs really nothing, and is within the power of any one with a garden to manufacture at home. I bruise with a mallet 40 lbs. of common laurel leaves and young shoots, put them into a copper with about 30 gallons of soft water, which is boiled for about an hour. The liquor is then of a nice sherry color, and of course very poisonous, but perhaps not more so than many insecticides. The above proportions of leaves and water I have used in the undiluted state, with soft soap in some cases to give it adhesiveness, and have found no ill results to occur even in the case of tender young growths of either in-door or hardy plants. It has been used this season, after exhausting our bought-in remedies, and it is so cheap that one need not be afraid of using it too abundantly. We keep now a good quantity of it always on hand, so that it can be got at for dipping or syringing at any time. It is advisable when using it on trees carrying fruits to wash it off before it has had sufficient time to dry on the fruit.

GOATS TO PROTECT SHEEP. — Farmers in New Jersey use goats to protect their sheep from dogs. Two goats can drive away a dozen dogs, and two are about all each farmer puts in with his sheep. As soon as a dog enters the field at night the goats attack him, and their butting propensities are too much for the canine, who soon finds himself rolling over and over. A few repetitions of this treatment causes the dog to quit the field, limping and yelling. Formerly, when a dog entered a sheep-field at night, the sheep would run wildly around and cry piteously. Since the goats have been used to guard them they form in line behind the goats, and seem to enjoy the fun.

A MODE OF HULLING WHEAT. — A Swiss process of removing the bran of wheat without loss of nutritive matter consists in moistening the wheat before grinding with a solution of caustic soda in water. The solution is prepared by dissolving six and two thirds pounds of caustic soda in one hundred and thirty-eight pounds of water. The steeping may be from fifteen to twenty minutes, and may be done in vats similar to those used by brewers. The caustic solution swells and loosens the hull proper, so that it may be removed by the slightest friction, leaving the gluten with the body of the grain.

Boston Journal of Chemistry.

JAS. R. NICHOLS, M. D., *Editor.*
WM. J. ROLFE, A. M., *Associate Editor.*

BOSTON DECEMBER 1, 1882.

PROFESSOR YOUNG.

WE have the pleasure of presenting to our readers, on the first page, another of Professor Young's admirable and instructive essays. It is a rare gift which our great astronomer possesses of bringing the sublime facts of astronomical science within the comprehension of ordinary readers, and at the same time maintaining that dignity of style and strict accuracy of statement which characterize the careful investigator and mathematician.

Professor Young's subject this month is a timely and most interesting one. The great comet which still "flames in the forehead of the morning sky," though with diminishing lustre, is not only a striking object in itself, but it has given rise, on both sides of the Atlantic, to speculations as eccentric and erratic as its own orbit among the stars. We are gratified to find that the views of our eminent astronomers are not of this sensational and alarmist character; and also that they are in substantial accordance with the opinions expressed in the articles on comets in our April, May, and June numbers this year.

For a period of more than ten years Professor Young has contributed to the columns of the JOURNAL, and his valuable articles will be found to be numerous in its files. The account of the great outburst of solar energy observed by him several years ago, and which created intense interest in all parts of the world, first appeared in our columns. We hope to place before our readers many more of his valuable contributions.

A HINT TO INVENTORS.

THERE is need at the present time of some electrical devices by which easy communication can be had between houses, manufacturing establishments, stores, and offices; between dwellings and stables, conservatories, libraries, etc. It is not necessary that words should be transmitted, but signals representing words or specific wants, suited to the needs of parties as they are found in all neighborhoods and towns. What is wanted is something that may be a substitute for the telephone, — something which any one can use; but it may be much less extensive in its capabilities. It would seem to be easy to devise apparatus suited to this want, but it needs thought and the exercise of a considerable degree of ingenuity. If this need can be satisfactorily met, it will serve an important end, and do much to break down the oppressive and outrageous monopolies connected with telegraphy and telephony. The latter as a monopoly is fast becoming more unbearable in its rapacious exactions than the telegraph has ever been. What is termed the "consolidation" of lines in New England has resulted in bringing into the field a class of speculators as owners, who have no other end in view but to extort money from the pockets of patrons in every way possible. The offices in the towns and cities in some instances are placed in charge of men wholly unfit for the positions. Their conduct indicates that they control the means of supplying a great

public want, which can be managed in any unjust manner that suits their caprice. Let inventors aid the people in breaking down this monopoly.

IN BEHALF OF THE PUBLISHERS.

THE accompanying index will remind our readers that another completed volume has been added to the files of the JOURNAL, which now form a popular encyclopædia of scientific and practical information, treasured in thousands of homes as one of the most entertaining and useful portions of the family library. The sixteen quarto volumes contain an immense amount of reading matter, much the greater portion of which is of no merely ephemeral interest, but possesses the permanent value of a standard work on the history and progress of science and the arts.

The publishers ask us to call attention to the "little bills" enclosed with the present number, and to request the favor of a prompt remittance of the amount they represent. For the proper methods of remittance our friends are referred to the "special notice" on the last page of reading matter. They will bear in mind that the dollars which are due, so insignificant when viewed singly, are, in the aggregate, of vital importance to the JOURNAL, being the means by which the publishers are enabled to prepare and distribute it monthly through the length and breadth of the land.

We would also invite our friends to look at our "Clubbing List," which enables them to economize considerably in ordering their yearly supply of periodical literature; and also to suggest that they glance at the fresh, attractive, and really valuable *premiums* which are offered to those who will make the slight effort needed to secure, one, two, or more new subscribers to the JOURNAL. The effort is slight, because the little monthly recommends itself wherever it is shown to intelligent people, while the price is so small that few cannot afford it. The publishers will be grateful for whatever the reader may do to make the JOURNAL more widely known, while at the same time they desire to compensate him fully for his friendly labor by the premiums they offer. Put a specimen number into the hands of your neighbor, and see if he does not gladly avail himself of your services in sending his subscription for 1883 to our Boston headquarters.

AN INTERESTING LETTER.

AN interesting letter has been received from J. Hendee, M. D., of Callierville, Alabama, which is presented below. We have not a personal acquaintance with Dr. Hendee, but have no reason to question the accuracy of his statements regarding the extreme age of some of his neighbors. If there is living in Alabama a man *one hundred and twenty-seven* years old, he must be the oldest man in this country, if not in the world.

The circumstances of the marriage of the young man as presented by the writer, who states that he was present at the ceremony, were indeed extraordinary. The marriage of the man at one hundred and two is also an event probably without a parallel in this or any other country. The conclusion of Dr. Hendee, that his locality is favorable to longevity, is certainly well founded.

In the October number of the JOURNAL, my attention was especially attracted by an article, "Health of the Tropics," because the opinions of the writer accord so exactly with my own experience of nearly fifty years in the practice of medicine. I have always lived and practised in a hot climate, and have tried to keep informed about other sections of our country. I am satisfied our statistics of health and longevity compare favorably with regions north of us. Not long since I was present at a marriage where the groom was twenty-four years of age, and there were present, besides many very ancient dames, his father, grandfather, great-grandfather, and great-great-grandfather, the last *one hundred and twenty-seven years of age*. He had walked two miles to be present. My neighbor, Mr. Beadon, has recently remarried, at the age of one hundred and two. He labors and makes cotton every year. It is true, this is an exceptionally healthy section; we do not use quinine, and have no malaria or mosquitoes. There are abundant springs and streams of pure water, game in considerable quantities, and mild summers, though hot enough for cotton, sugar-cane, rice, and two crops of Irish potatoes a year. Something may be due to sparseness of population and primitive style of living, as you may suppose when I tell you that good arable land is often sold for a dollar an acre. It is a well-provisioned country, and a tranquil life and freedom from anxiety, "far from the madding crowd's ignoble strife," may have their influence.

Allow me to mention further that not long since I called on an old, hale, and hearty friend across the creek, who is eighty-six years old. He does a large amount of work, and makes fine crops every year. I read to him a portion of a recent article in the JOURNAL on the deleterious effects of tea and coffee, and also another on the impurities found in water as shown by the microscope.

"Well, doctor" said he, "I never had much use for tea; it 's a *wishy-washy* sort of stuff; but I 've been drinking strong coffee three times a day for nigh on to sixty years; and if I 'm to give up that, and the water has animiracles in it, ask those gentlemen if they 'll let a feller have a little old rye whiskey, just to keep the fog out of his throat of a cold morning."

I enjoy the JOURNAL, and wish it came weekly instead of monthly.

HAILSTORMS AND FORESTS.

A GENEVA correspondent of a London journal, writing on the 1st of September, gives the following interesting and striking illustration of the influence of forests upon the meteorological conditions of a district: —

Hailstorms, as is well known, often play sad havoc in Switzerland as well as in other parts of Europe. They generally last only a few minutes, but in that time the crops of a whole district may be destroyed, trees stripped of their fruit and leaves, and even potatoes in the ground hacked to pieces. Birds are sometimes killed by the hundred, and a grape-vine touched by the hailstorm is ruined forever. Seven years ago there was a hailstorm in this canton, which in less than five minutes did damage estimated at a million francs. In some districts there are mutual hail insurance societies, as in other countries there are mutual fire insurance societies. In these circumstances everything relating to the phenomena and causes of these visitations is studied with great interest, and papers on the subject, read at the meeting of the Association of Swiss Geographical Societies, held this week at Geneva, by Herren Beaumont and Riniker, of Aargau, are attracting considerable attention. The utility of forests as a safeguard against avalanches and a hindrance to *tourments* and snow-drifts has often been pointed out, but it has never before been suggested that forests are a preservation against hailstorms. Such, however, is the opinion of Herr Riniker, who is chief forester of Canton Aargau. He says that where there are forests there are no hailstorms, and in support of this theory he adduces a remarkable fact, for the accuracy of which he and many others can personally vouch. In the south of Aargau there is a little chain of mountains known as the Lindenberge. The Lindenberge are about 16 miles long, of an average height, above sea level, of some 800 feet, and completely covered with wood. About twenty years ago, the forest was divided in two places by wide gaps, with the consequence that the valleys at the foot of the mountains were soon afterwards visited with frequent hailstorms. The hail-charged clouds were seen to traverse the gaps. In 1868 the wider of the two open spaces was closed by a plantation of firs, and since 1871 no hailstorm has crossed the forest. In explanation of this phenomenon Herr Riniker suggests that, as hailclouds are saturated with positive electricity, and trees conduct from the earth negative electricity, the meeting of the two currents develops sufficient heat to prevent the complete congelation of the clouds, and even to thaw the hailstones contained in them, — for the clouds of this description pass very near the earth, — and so convert the frozen particles into rain. If further observation should confirm the accuracy of Herr Riniker's conclusions in this regard, the importance of forests in countries where hailstorms are frequent will be greatly increased.

METEOROLOGY FOR OCTOBER, 1882.

THE sum of my observations on the weather for the past month has been as follows: —

Average Thermometer.		Lowest.	Highest.	Range
At 7 A. M.	48.45°	34°	65°	31°
At 2 P. M.	61.48°	51°	75°	24°
At 9 P. M.	53.16°	38°	66°	28°
Whole month	54.03°	34°	75°	41°
Second average[1]	53.55°			
Last 19 Octobers	49.04°	40.60° in 1864.	56.16° in 1879.	15.56°
Second average[1]	48.38°	39.90°	55.38°	15.48°

[1] Found by adding the average evenings *twice*.

The average barometer for the month was 30.045 inches; the lowest, 29.69, on the 25th, and the highest, 30.30, on the 6th, a range of .61 of an inch. The average for the last 10 Octobers has been 29.977; the lowest, 29.826, in 1875, and the highest, 30.091, in 1881, a range of .265 of an inch. The sum of daily variations was 3.50 inches, an average daily movement of .113 of an inch. The average for the last 10 Octobers has been .... with extremes of .113 and .212, in 1882 and 1[illegible]. The rainfall in those years was 2.12 and 4.00 inches. The largest daily movements the past month were .28 and .25 of an inch on the 11th and 23d.

The face of the sky in 93 observations gave fair, 17 cloudy, 33 overcast, and 3 rainy. The amount of rainfall was only 2.12 inches; the smallest was .75 of an inch in 1874, and the highest 5.[illegible] in 1869, doing much damage. The average amount for the past 14 Octobers has been 4.09 inches.

The direction of the wind in the usual observations gave an excess of 13 northerly and 17 westerly over the southerly and easterly, indicating the prevailing direction, approximately, to be west 3[illegible] north, nearly the same as last month, a full N. by W. The average for the past 14 Octobers has been west 6° 20′ north. The west has unitedly prevailed over the east by an average of 36.[illegible] servations, with extremes of 4 and 56, while the north has prevailed over the south every year except three, and one year (1876), when they were balanced. The average northerly excess has been only 4 observations.

I may further remark that the temperature of the month was 5° above the average, having been exceeded only twice during the last 19 years, namely, in 1875 and 1879. The mercury went below 38° only twice during the month, at the hours of observation. These were on the 27th and 28th, when the first light frosts of the season occurred. Though the spring and early summer were very backward, yet the late autumn brought the corn and fruits of the region, not too much injured by the drouth, to unusual maturity. Grapes especially were finely ripened, though not very abundant. The excessive drouth of the summer was checked by the unusual rains of September, and the parched fields started up with the peculiar freshness and green of spring, affording abundant fall feed, and greatly relieving the severity of the summer drouth.

Another peculiarity of the month was its excessive cloudiness, with little rain. October is usually fair and often pleasant, but the past month had 50 cloudy and overcast observations (33 overcast), with only 40 fair. The average for the past 18 Octobers has been 56.7 fair and 26.8 cloudy and overcast, these being nearly equal. Only one October in 18 years has been as low as 50 fair, or higher than 33 cloudy and overcast. Yet the amount of rain the past month was but little more than one half the average. D. W.

NATICK, *November* 8, 1882.

EDITORIAL NOTES.

AUSTRALIAN BIG TREES. — A foreign exchange says: "The trackless forests in the west of Tasmania contain huge timber, and bushmen report that they have met with specimens of Eucalyptus measuring 200 ft. from the ground to the first branch, and fully 350 ft. in all. Until 1873 there was standing on the eastern slope of Mount Wellington, within four miles of Hobart Town, a Eucalyptus which measured 86 ft. in girth and more than 300 ft. in height, and its ruined boll still forms a grim chamber, in which many a merry party have enjoyed a picnic. The famous tree of the Huon Forest measures 70 feet in girth 6 ft. from the ground, and is stated to be 240 ft. high; but in the deep gorges of this grand forest the writer has seen higher trees than this, though not of quite equal circumference. Victoria, however, now claims the glory of holding the biggest of all the living 'big trees' in the world, so far as height is concerned. In the Dandenong district at Fernshaw has recently been discovered a specimen of *Eucalyptus amygdalina*, or almond-leaf gum, which, accurately measured, reached the enormous height of 380 ft. before throwing out a single branch, and 430 ft. to the top, and having a girth of 30 ft. at some distance above the ground." Some idea of what an elevation of 430 ft. represents may be gained from the fact that this gum-tree, if growing by the side of the Bunker Hill Monument, would stand almost twice as high as that lofty obelisk, which is 220 ft. in height.

HIPPOPHAGY. — From the recent official report it is seen that the use of horse-flesh as an article of human food is steadily increasing in Paris. In 1875, 7000 horses were slaughtered for this purpose; in 1880 the number was 9000; and in 1881, 9300. Besides these, there were sold at the forty establishments exclusively devoted to this business 10 carcasses of donkeys in 1875, 320 in 1880, and 400 in 1881. The estimated weight of horse-flesh consumed in Paris last year was about 1670 English tons, and in addition about 18 tons of donkey-flesh, without reckoning the offal, which is used in the making of sausages.

A TUN BIGGER THAN THE HEIDELBERG ONE. — The famous big tun of Heidelberg is not the biggest in the world. According to the *Suabian Mercury*, it is not only the largest, but the handsomest receptacle of the sort is to be found in the environs of Stuttgart, at Ludwigsburg, the Versailles of Würtemberg, where it is shown to favored visitors of the palace. The Ludwigsburg tun was made in 1719, of oak and pear-tree wood, by order of Duke Eberhard III., and is ornamented with carvings superior in beauty to those of its Badenese rival, constructed thirty-two years later. Its capacity is 300 Würtemberg fuders, a liquid measure equal to 388.15 gallons, while that of the Heidelberg tun is set at 245 fuders. This would give the Heidelberg tun a capacity of something over 95,000 gallons, whereas Murray states its capacity at 800 hogsheads, or merely 43,200 gallons. Its size is 36 feet by 24 (height). The original big tun of Heidelberg was constructed by Michael Warner in 1589–91, of beams 27 feet long, and having a diameter of 18 feet, with 5½ tons of iron hooping, and its capacity was set at 132 fuders, the fuder being called "four English hogsheads," though in reality the Baden fuder is 333.14 gallons. It was this tun which Thomas Coryat saw in 1608, and described in his "Crudities."

CARNIVOROUS LAMBS. — The fact that lambs have been reared on animal food will probably create some little astonishment, but the idea is not new. All animals reared on milk have been reared on animal food; but M. Regnard has been utilizing dried blood from the slaughter-houses, which he dried at 212° F., pressed, and powdered in a coffee-mill. This powder of blood was given in doses of ten to eighty grams daily, mixed with other food. The experiments were made on six lambs deserted by the ewes. Three were fed with the usual diet of beet-root, hay, etc., and to three the powdered blood was given. The first steadily lost flesh, while the latter increased to three times the original weight, and connoisseurs declared that they had never seen such fine lambs of the same age. The animals surpassed their fellows which had been suckled by their dams both in weight and size, and their coat of wool became doubled in thickness. Experiments of the same kind are now in progress with calves, and promise to be as successful as the others. Rickety children are also stated to thrive on the blood diet.

PRESERVING WOOD FROM DECAY. — The increasing cost of wood for constructive purposes and for railroad ties is one of the most serious problems which confront the managers of railroads. Processes of preservation of wood have been tried with more or less success on nearly all of our trunk lines. The latest method suggested for the preservation of bridge timber and ties consists in first subjecting the finished timber to dry heat, and then immersing it in a hot bath composed of asphalt and carbolic acid. On cooling, the solvent of the asphalt evaporates, leaving a skin or coating of asphalt on the surface of the wood that resists water and keeps the antiseptic material locked within the pores of the wood. The exterior of the wood presents a smooth and dark surface, requiring no painting. It is understood that the process is to be used on a large scale on one of the Canadian trunk lines.

ATOMS.

A WELDING powder named antimonoid has been in use for some time past in Germany, and found to be of great efficiency. It consists of four parts of iron turnings, three parts of borax, two parts of borate of iron, and one part of water.

ELECTRICAL motors have now been introduced at several French collieries. A Gramme machine has been in use for some time past at the Blanzy mine, and others are at work in the Thibaud mines, belonging to the Terre-Noire company, and at the mine de la Peronnière.

AN important literary and scientific discovery is announced from Salonica. The works of the celebrated physician, Galen, which were supposed to have been lost, have been discovered by M. Papageorges. They are in manuscript, date from the fifteenth century, and appear to have originally formed 248 sheets; 134 are in good condition, 34 are mutilated or worm-eaten, and 80 are missing.

A GERMAN patent has just been taken out for the manufacture of bottles, etc., from cast iron, containing twelve per cent. of silicon, a compound which is said to resist the action of the strongest acids. It is also recommended for the iron plates of zinc and iron galvanic batteries.

PROFESSOR NORDENSKJOLD, during his Arctic voyage, was perplexed by the question, What becomes of the bodies of animals which die a natural death? He very seldom found such remains, and declared that on Spitzbergen it was easier to find vertebræ of monster extinct reptiles than the bones of the seal, walrus, or bird of the present day. The problem is yet unsolved.

THE sorrowful tree, so named because it flourishes only at night, grows upon the island of Goa, near Bombay. The flowers, which have a fragrant odor, appear soon after sunset the year round, and close up or fall off as the sun rises.

THE tensile strength of glass has been shown to be between 2000 and 9000 lbs. per square inch, and the crushing strength between 6000 and 10,000 lbs. per square inch. By trials a short time ago, M. Traulionie found that flooring glass one inch square and one foot between the end supports breaks under a load of 170 lbs.

A LACQUER for steel may be made of 10 parts of clear mastic, 5 of camphor, 15 of sandarac, and 5 of elemi gums dissolved in pure alcohol, filtered, and applied cold. This varnish is transparent.

LITERARY NOTES.

A Manual of Blowpipe Analysis, with a complete System of Determinative Mineralogy, by H. B. Cornwall, has just been published by D. Van Nostrand. No department of analtyical chemistry has made so great advances of late years as blowpipe analysis. The enormous development of the mining interests has stimulated research, until the old clumsy methods of assaying in the wet way have been almost entirely superseded by the quick, easy, and elegant manipulations with the blowpipe. Instead of working in a close and unhealthy laboratory, surrounded by cumbrous and expensive apparatus, the modern mineralogist takes a blowpipe and a small case of dry reagents in his pocket, and determines the minerals on the very spot where they occur. The present work is remarkably complete, accurate, and thorough, and is greatly needed by every student of mineralogy. It is arranged somewhat on the plan of Fresenius's standard chemical works, and we predict that it will take an equal rank with them in the subjects on which it treats. The tables for determining unknown minerals are of the greatest value, and superior to anything that has been heretofore published.

Speech and its Defects, by Samuel O. L. Potter, M. D. ($1), treats of the various defects of articulation, with especial attention to stammering. In the opinion of the author, this troublesome affection is perfectly curable, and he gives very full directions in regard to his method, besides a great deal of valuable information regarding the history and statistics of the various diseases of the voice.

The Orange Judd Company have just published *Injurious Insects of the Farm and Garden*, by Mary Treat ($2). It is a matter within the experience of most farmers that, by supplying it with food, the "potato bug" has been induced to migrate from its home in Colorado, to the shores of the Atlantic, and has left its mark on the way. These invasions of insect enemies are so sudden that the standard works of a few years ago usually fail to give any information about the injurious insects of the present day. While we have the excellent works of Harris and Packard, the farmer and gardener may consult them in vain for information about a recent comer. Mrs. Treat has done a good work in gathering the most important of these scattered materials, and in presenting them in a condensed form in the present work. She has also given, in several cases, the results of her own observations. The present work is especially valuable for its abundant illustrations. With insects, a good engraving is far more useful than a detailed description, and in view of this fact the publishers have introduced illustrations of the insects in their various stages, wherever it could be done to advantage. The work gives a popular account of those insects most injurious to the cultivator, and suggests the best known agents for their extermination.

All the above books have been received by A. Williams and Co.

Medicine and Pharmacy.

HOW TO MAKE A POULTICE.

THE following article in the London *Practitioner*, from the pen of the accomplished editor, Dr. T. Lander Brunton, will be of interest to our non-professional readers, and possibly, as he suggests, to some of the professional ones: —

At first sight, the title of this paper may seem to many of our readers absurd, and the idea that medical men require any instruction in making a poultice preposterous; but we have been led to write it from seeing that many students and some practitioners do not distinguish between the proper methods of making a poultice for surgical and for medical use. Many, perhaps most, students spend a great part of their four years' curriculum in surgical study, and devote a comparatively small portion of it to medicine. This may partly be the reason why they do not learn the best ways of making poultices for the relief of internal pain: but another reason is that in hospitals poultices are made in certain ways for the sake of cleanliness and economy, and these ways are not always the best possible for private patients, although they may be the best under the conditions which obtain in hospitals. Every one knows the relief which a poultice affords when the finger is inflamed, and has noticed how the painful throbbing diminishes after its application. Most people have noticed also that dipping the finger in cold water has a similar action, and it seems strange to many that the opposite conditions of heat and cold should have a similar effect. The reason probably is that both heat and cold lessen the force of the impulse with which the blood is driven through the dilated arteries of the inflamed parts against the block which exists in the capillaries. Cold causes the afferent arteries to contract, and lessens the impact of the blood by diminishing the quantity sent to the inflamed part; a poultice lessens the impact by dilating the capillaries surrounding the seat of inflammation and affording a ready side outlet into the veins. In surgical cases we usually use the warmth and moisture of the poultice to act directly on the surface. We therefore make the poultice with crushed linseed or with linseed meal and oil, spread it on some tow, and apply it to the skin without anything intervening. But useful though this method may be for wounds, ulcers, and abscesses, it is not the best form of application in cases of inflammation of the thoracic or abdominal viscera, or where spasm is present without inflammation. In such cases we may, no doubt, do some good by applying the poultice to the surface exactly as in surgical diseases. We may draw off some of the blood to the surface, and we may also exercise a reflex action through the nerves upon the vessels of the inflamed organ below; but this will not be so great if we influence the surface only, as when we allow the heat to penetrate to the inflamed or irritated organs themselves. If we apply the poultice directly to the skin, it must be allowed to become tolerably cool before the patient can bear it, and thus half its advantage is lost. In order to relieve spasm, as in colic, — intestinal, biliary, or renal; to relieve inflammation of the pleura, the lungs, the liver, or other organs, we want to apply the poultice as hot as possible, while we protect the skin from being scalded.

In order to do this, a flannel bag should be prepared, a convenient size being twelve inches by eight; this should be closed at three edges and open at the fourth; one side of it should be about one inch or one inch and a half longer than the other; and it is convenient also to have four tapes attached at the points which form the corners when the bag is closed, in order to keep the poultice in position. Besides this, another strip of flannel should be prepared, of the same breadth as the length of the bag, and long enough to wrap round it once or oftener. Crushed linseed, bowl, and spoon should then be got together, and the spoon and bowl thoroughly heated by means of boiling water; the poultice should then be made with perfectly boiling water, and rather soft. As soon as it is ready, it should be poured into the bag, previously warmed by holding it before the fire; the flap which is formed by the longest side of the bag should now be turned down and fastened in its place by a few long stitches with a needle and thread; it should then be quickly wrapped in the strip of flannel (also previously warmed), and fastened *in situ*, if necessary, by means of the tapes. It may be covered outside with a sheet of cotton wool. In this way the poultice may be applied boiling hot to the skin without burning; the two layers of flannel, which are at first dry, allow the heat to pass very gradually indeed to the skin; as the moisture of the poultice soaks through them, they become better conductors, and the heat passes more quickly, but the increase is so gradual as not to cause any painful sensations whatever, but only one of soothing and comfort. The poultice also naturally keeps much longer hot, and the necessity for changing it arises much less frequently.

The difference between the effect of a poultice made in the ordinary way and in the manner just described is sometimes exceedingly striking. It is, perhaps, less marked in cases of inflammation than in those of spasm. We have seen a patient suffering from intense abdominal pain at once relieved by a poultice made in the way just described, although a succession of poultices made in the ordinary way had been utterly useless. This way of making poultices is one of the minutiæ of medical practice; apparently extremely trivial, but really, we believe, very important. The relief which we have seen afforded by poultices made in this way, and the knowledge that *some* practitioners at least are ignorant of the method, must be our apology for drawing attention to such a trivial detail.

GOLD AS A MATERIAL FOR FILLING TEETH.

BY S. B. PALMER, M. D. S., SYRACUSE, N. Y.

IN the BOSTON JOURNAL OF CHEMISTRY for September may be found an article under the above title, which might lead the reader to think "that gold is an inferior material for filling teeth." As one credited with such conclusions, it becomes a duty to state facts respecting the utility of gold for preserving teeth. As stated in the article referred to, there has been much opposition to the views of the gentlemen therein mentioned, because of their teaching that the value of gold for the purpose of saving teeth is limited, and that other materials, under certain circumstances, are to be preferred. It is not my purpose to controvert other statements; it is enough to say that, in order to put down the "heresy" mentioned, quotations like the above — that gold is an inferior material for filling teeth — have been freely used, without regard to special application. In a limited sense it is true; in general it would be false. It would be equally proper to ask, What is the best medicine for a sick person? as to ask, What is the best material for filling teeth? So far as the writer is concerned, or has knowledge respecting the "new departure" mentioned, there is no faction in the dental profession opposed to the use of gold to the full extent of its capabilities for preserving teeth. Within its limits, there is no material so desirable as gold. Dentistry is fast becoming eclectic in practice. Many who refuse the teachings of science in relation to filling teeth have attained the knowledge empirically, and thus accomplish the desired object of tooth preservation. It is not necessary to go outside of the professional journals to establish the so-called "electro-chemical theory," — time and science will care for that, — but it may be interesting to the reader to know the conditions which would decide for, or against, the use of gold. I think it a fair estimate that gold, manipulated by the most skilled operator, may be considered best for eighty per cent. of the operations demanding fillings. The well-developed normal tooth, according to accepted analyses, is composed of seventy-two parts of mineral matter, lime salts, etc., and twenty-eight parts organic or animal matter. The mineral portion is a non-conductor of thermal changes and electric currents; the organic constituents, like cartilage, are a conductor. It so happens that the combination in proportions already mentioned gives teeth sufficiently dense not to be seriously affected by currents or changes of temperature. Thus teeth of average density, or even below the percentage given, may be filled with gold with safety. The requirements are simply mechanical, — that the gold perfectly fits the walls of the cavity, so as to exclude fluids; nothing more is required. There are two conditions which militate against the use of gold: first, when, for any reason, the filling cannot be made perfect, or, in other words, leaks; second, when the structure of the tooth is far below medium, say fifty per cent. organic matter. Children's teeth generally come under this head. The requirements for preservation in such cases are that exciting agents and sudden changes of temperature be excluded till nature completes the work of calcification, so as to render the tooth a non-conductor. The contact of gold upon dentine, so highly organized, causes inflammation, or sensation in a degree to arrest the process of calcification; the result is death to the sensitive surface, instead of its becoming dense by the addition of lime salts, as would be the case under a gutta-percha or non-conducting plug. The devitalized dentine changes color, and soon begins to decompose around the filling. The durability of such fillings is limited to from one to five years. The destruction of a good tooth from a leaky filling comes under the same law; decomposition of the fluid between the filling and tooth bone soon acts upon the latter, and when the vital surface is once destroyed the strong tooth is subject to secondary decay alike with the abnormal tooth. The best material for filling poorly calcified teeth is one most resembling tooth bone, or one the least conductive. Gutta percha is much used, but unfortunately it is not sufficiently hard to stand attrition. Tin and amalgam are much used in a class of teeth where gold would not preserve the tooth as well. It has long been admitted by eminent dentists that tin possesses antiseptic properties to arrest decay in teeth of low grade of density that gold does not. Amalgam also possesses the same, but on account of prejudices against the latter I have always taken tin as the material upon which to found the theory of preservation by the use of base metals.

It has never been claimed that gold is more than a stopper; beyond that it fails to impart to the soft dentine any property to prevent decay around the filling. Gutta percha and some other materials while they do not directly change the surface of the bone in contact with the filling, exclude fluids, and by their non-conducting properties allow nature to complete the work of calcification. Tin and amalgam accomplish the same end by a chemical process. These are, at first, less conductive than gold, which is one point gained for nerve quiet after filling. Again, the moisture contained in the soft tooth bone tarnishes the plug; we never find the inner surfaces of such fillings bright. This chemical change results in a gradual formation of soluble salts of silver, tin, copper, or other metals in the filling; and these, being dissolved, are taken up by

ıe contiguous tooth bone, which, with the incor-ɔrated metallic salts, becomes so in affinity with the lling that electrical harmony is restored. When ıis surface combination takes place, irritation ɜases, and nature goes on with the work of re-ılcification beneath. Teeth once filled in this anner may, in after years, receive gold fillings ith success; or, if the cavity be partially filled ith a material which will furnish the metallic salts, e balance may be filled with gold at first. Thus may be seen that we may use gold for the ɐservation of teeth in many cases where alone it would certainly fail.

One of the strong arguments against the theory the electrical action of metals upon tooth bone is e fact that bone is a non-conductor, and is not an ɛctrolyte. This applies to teeth in a normal con-ɪion, — teeth which we all agree may be filled with ld without electrical action; just as in a battery prived of its positive element there can be no tion. The positive element consists in the un-ıble fluids which fill the cartilaginous or organic rtion of the tooth. As already stated, thermal anges produced by a metallic conductor devital-ı the surface contiguous to the filling; decomposi-n of the organic matter, as well as the fluid, is ɜ result, and the acid thus formed finds ready ınity in the lime salts which compose the dentine. may be easy to prove that tooth bone is not acted ɔn primarily by the electric current, but this does ; change the fact that secondary actions, as above ıcribed, work disastrously.

In conclusion, let me say that science plainly ches that the preservation of teeth by filling is ıtrolled by chemical laws. If these are obeyed, obtain the desired results; but if they are dis-arded, disappointments follow. For this reason ɾould like to see operative dentistry rest upon a ɛntific foundation, in order that the inexperienced ctitioner might understand the laws of success l failure, and thus diagnose conditions so as to ɛct materials and apply them in a manner to en-ɜ success.

ABSORPTION OF POISONS BY PLANTS.

Professor F. C. Phillips has been making ıe experiments to determine what, if any, ·e the influences of metallic oxides in the soil plants growing in it. The two points inves-ıted were whether, under those conditions, ıts in a perfectly healthful state will absorb ɜain oxides, and whether any injurious effects produced upon them. The conclusions ɔhed are as follows: —

1.) That healthy plants, grown under favorable ɖitions, may absorb through their roots small ntities of lead, zinc, copper, and arsenic. (2.) .t lead and zinc may enter the tissues in this without causing any disturbance in the growth, ·ition, or functions of the plant. (3.) That the pounds of copper and arsenic exert a distinctly onous influence, tending, when present in large ıtity, to check the formation of roots, and either ng the plant or so far reducing its vitality as to rfere with nutrition and growth. It has been by some naturalists that plants absorb only elements as are essential and nutritious, refus-to take up what is poisonous or non-essential, that metallic compounds found in them by anal-are to be traced to atmospheric deposits ad-ıg to them externally. These experiments by ɛssor Phillips seem, however, to confirm the ries of Freytag, that plants absorb all soluble ers indiscriminately through their rootlets, and the absorption of poisonous metals causes no ırbance until a certain degree of concentration ached, when the plant rapidly withers and dies. It is thus of the greatest importance to prevent any crop-growing soil from becoming impregnated with any poisonous elements, since the land will bear crops, year after year, containing a perceptible percentage of danger.

MEDICAL AND SANITARY NOTES.

The Nutrient Treatment of Insanity. — "The greater my experience becomes," writes Dr. Clouston in the Annual Report of the Royal Edinburgh Asylum for the Insane, 1881, "I tend more to substitute milk for stimulants. I don't undervalue the latter in suitable cases; but in the very acute cases, both of depression and maniacal exaltation, where the disordered working of the brain tends rapidly to exhaust the strength, I rely more and more on milk and eggs made into liquid custards. One such case this year got eight pints of milk and sixteen eggs every day for three months, and under this treatment recovered. I question whether he would have done so under any other. He was almost dead on admission, acutely delirious, absolutely sleepless, and very nearly pulseless. It was a hand-to-hand fight between the acute disease in his brain and his general vitality. If his stomach could not have digested and his body assimilated enough suitable nourishment, or if he could not have been taken out freely into the open air, he must have died. But to-day he is fulfilling the duties of his position as well as he ever did in his life. All acute mental diseases, like most nervous diseases, tend to thinness of body, and therefore all foods and all medicines and all treatments that fatten are good. To my assistants and nurses and patients I preach the gospel of fatness as the great antidote to the exhausting tendencies of the disease we have to treat, and it would be well if all people of nervous constitution would obey this gospel."

The Common Mushroom. — Professor Ponfick, of Breslau, has been making experiments on the common mushroom, and tells us in detail, and with the authority of science, what was somewhat vaguely known before, namely, that all common mushrooms are poisonous, but cooking deprives them in a greater or lesser degree of their poisonous qualities. The repeated washing with cold water which they usually undergo to clean them takes away a portion of the poison, and boiling does the rest; but the water in which they have been boiled is highly poisonous, and should always be carefully got rid of. Dried mushrooms are still dangerous for from twelve to twenty days; they require to be dried for at least a whole month, and are only really safe after four months' drying.

Lead-Paralysis from Contact. — A man aged twenty-eight, very robust, recently came into M. Hérard's service at the Hôtel-Dieu, in Paris, on account of a paralysis of the fore-arm. When in the army, whether in Algiers or Senegal, he always enjoyed the best of health in localities where numbers were dying around him, — always having taken care to wear double flannels in the hottest countries. On leaving the army he became a carter for the transport of merchandise, and three weeks before admission had been transporting white lead. While loading his cart, one of the barrels burst, and he employed his left hand in endeavoring to save as much of the lead as he could. The hand and fore-arm were thus covered with lead. The next morning the extensors of the arm were paralyzed. It was a purely local paralysis, and neither colic nor any other sign of lead-poisoning was present.

Pneumonia an Infectious Disease. — The *Philadelphia Reporter* says: That acute, lobar, croupous pneumonia is considered by some an infectious fever, with evident tendency to the lungs, or, as now better expressed, a zymotic disease, caused by the inhalation of bacilli, which accumulate mostly in a lower lobe of one lung, we have often had occasion to note. The proofs of this statement accumulate daily.

Dr. Köhnhorn found that the disease had become endemic in one of the barracks at Wisel. Occasionally it broke out as a local epidemic. The regiment stationed there had suffered frequently from the disease. Not a year passed without many falling victims to pneumonia. The regiment was then placed in other quarters, and no further case happened in this regiment. The barracks were torn down, the soil disinfected most thoroughly, as also all the building material. Since the regiment has been camping in these rebuilt barracks not a solitary case of pneumonia has made its appearance.

Health on the Heights. — A health station for patients suffering from pulmonary consumption is to be erected on the summit of the Schwarzhorn, in Switzerland, at an elevation of about 10,000 feet above the sea. The hotel, which is to bear the name of "Adlerhorst" (eyrie), will be built to accommodate 200 guests, and be accessible by a narrow carriage-road, as well as by a wire-cord tramway. The construction of the hotel is to be proceeded with at once, and the house is to be ready for occupancy in two years. The necessary capital has been subscribed.

A Good Point for Carbolic Acid. — According to Dr. Robert J. Lee, carbolic acid is the only antiseptic that can be volatilized in a definite and constant manner. This is a most important fact in treatment, and deserving attention. If a solution of one part of carbolic acid in eighty of water be distilled under slight pressure, the vapor will contain the same proportion of the acid as the solution during the process of boiling; so that we can obtain vapor of any strength, and diffuse it in the atmosphere. Other antiseptics are often too volatile, as, for example, thymol, which comes off very rapidly from the boiling water, as does also benzoic acid, so that they are not convenient for inhaling.

THERAPEUTICAL HINTS.

Alcohol in Burns and Scalds. — Saturate a soft piece of fabric with alcohol, lay it over the burn, then cover it with cotton or finely picked oakum. This is the most cleanly dressing that can be adopted. It may be thought that alcohol applied to a burn will produce more pain; but try it, and you will be agreeably surprised to observe how quickly it will allay the pain. Subsequently disturb the dressing as little as possible; wet the dressing occasionally with alcohol, and the result you will find better than by any other method.

Treatment of Excessive Sweating. — In the Michigan *Medical News*, Dr. Currie says that for over thirty years he has used the following prescription, without a single failure, in sweats, from whatever cause: alcohol O i., sulphate of quinine 3 i. Wet a small sponge with it, and bathe the body and limbs, a small surface at a time, care being taken not to expose the body to a draught of air in doing it. In one case, a neighboring physician was poisoned while dressing a mortified finger. He suffered untold misery, and was drenched with perspiration for a number of days, and his life despaired of. When he saw him he ordered him to be bathed immediately in the above solution, and that this be repeated once in two hours. The third application stopped all perspiration, and convalescence began at once.

Excessive Sweating of the Feet. — Dr. Meierhof, in the *Maryland Medical Journal*, directs the patient to immerse his feet morning and night, for about ten minutes, in warm water at 115° to 120° F., in which a teaspoonful (3 i.) of powdered commercial soda (impure carbonate of soda) is dissolved. The feet are then thoroughly dried, after which

they are painted all over with a coating of compound tincture of benzoin, which acts as an antiseptic astringent and by its mechanical presence on the skin. This treatment is continued for about ten days, after which it is practised once daily, or every other day, as the necessities of the case may require.

BORAX IN ERYSIPELAS. — A writer in the *Philadelphia Medical Times* says that he has for eight years made a practice of treating erysipelas by the local application of borax dissolved in glycerine, one drachm to an ounce, which is to be well rubbed in and applied on linen. The result has been to cut the disease short apparently in a few hours. In some cases he used tincture of iron internally, in some not.

TREATMENT OF STYES ON THE EYE. — As a means of "backing" a stye, Dr. J. P. McGee, of Tennessee, states that the practitioner can use to advantage the following treatment: —

℞ Fl. ext. belladonnæ . . . . . gtt. iij.
Aquæ pluv. . . . . ℥ij. M.
Sig. A teaspoonful every hour.

At the same time he may give calcium sulphide, one eighth or one tenth of a grain every hour, for five or six doses, then every three hours, although the belladonna is often sufficient alone. Remember, this is sufficient only in the very early stage of the affection, — within the first six or twelve hours. He will find it "back" at least three of the five.

FORMULÆ AND RECIPES.

SACCHARATE OF CUBEBS. — The following formula has been proposed by one of the committees appointed by the Société de Pharmacie of Paris to make suggestions for the revision of the Codex: —

Ethereal alcoholic extract of cubebs .	100 parts.
Powdered sugar	700 "
Powdered gum arabic	200 "

ABSORBENT COTTON. — A correspondent inquires how this is prepared. The following processes are given in the *Journal of Pharmacy and New Remedies*: —

(1.) Take of

Cotton free from foreign impurities and carded	10 parts.
Solution of soda	300 "
Chlorinated lime	8 "
Hydrochloric acid	q. s.
Water, each, a sufficient quantity . .	q. s.

Boil the cotton with 150 parts of solution of soda for half an hour; then remove it, wash it thoroughly with water, and, press out the excess of the latter. Agitate the chlorinated lime with 150 parts of water, and, having strained the mixture, immerse the cotton in the strained liquid for twenty minutes; then wash it again with water, dip it for a short time in water acidulated with sufficient hydrochloric acid to preserve an acid reaction; again wash it with water, and next boil it again with 150 parts of solution of soda. Wash it, dip it once more in water acidulated with hydrochloric acid, and then wash it with water until the washings cease to be clouded by nitrate of silver. Finally press out the excess of water, dry the cotton quickly, and afterwards pick it or card it into loose masses.

(2.) Treat loosely carded cotton with (low-boiling) petroleum benzine, either in a well-covered percolator, or in a suitable apparatus where the percolate may be subjected to a continuous heat so as to volatilize the menstruum, and return it constantly, in a condensed form, to the cotton. The latter, after being thoroughly aired, may be subjected, if necessary, to a bleaching process. But great care must be taken that no trace of chemicals is left therein. Finally it should be again carded.

THE HARDENING OF RUBBER GOODS. — In the opinion of Herr W. Hempel the hardening of vulcanized india rubber, which takes place with piping and other goods after a short period of use, is caused by the gradual evaporation of the solvent liquids contained in the india rubber, and introduced during the process of vulcanization. Herr Hempel has made experiments for a number of years in order to find a method of preserving the india rubber. He now finds that keeping in an atmosphere saturated with the vapors of the solvents answers the purpose. India rubber stoppers, tubing, etc., which still possess their elasticity, are to be kept in vessels containing a dish filled with common petroleum. Keeping in wooden boxes is objectionable, while keeping in air-tight glass vessels alone is sufficient to preserve india rubber for a long time. Exposure to light should be avoided as much as possible. Old hard india rubber may be softened again by letting the vapor of carbon bisulphide act upon it. As soon as it has become soft it must be removed from the carbon bisulphide atmosphere and kept in the above way. Hard stoppers are easily made fit for use again in this manner, but the elastic properties of tubing cannot well be restored.

SEALING FOR CORKS. — M. Potel has lately introduced a new compound for sealing over corks, and for moulding various ornaments, etc. It is made by soaking gelatine in water for a short time, and then dissolving it in glycerine, the former being in excess; to half the amount of glycerine thus used some tannic acid is added, and solution aided by the heat of a water bath; these solutions are then mixed, when the compound is ready for use. Any desired coloring matter may be added, and if required for the fabrication of any small article, sulphate of barium.

FACETIÆ.

TAKING HIS OWN MEDICINE. — Dr. Smith, of Chelsea, Vt., lately prescribed for a patient, who soon after returned, ailing more than ever, and suggested that the medicine was poison. Dr. Smith remarked that he had "just as lief take a pint;" so, putting the bottle to his lips, he drank half its contents. Then the doctor's head began to whirl, and he rushed to the drug-store for an emetic, which saved his life. It seems that belladonna had been put in by mistake. The patient was not seriously injured. Happily, there is not yet a vacancy for the waiting medical man. Moral: Medicine is for the sick.

STEALING MEDICAL ADVICE. — It is very well known that, although medical advice is made much sport of by certain of the laity, it is a practice among some to get such advice surreptitiously at an ordinary social interview, whenever they can. The most innocent conversation sometimes conceals an insidious demand, or ends in a direct request for a medical opinion. One day a physician met in the street a gentleman who was accustomed to annoy him in this way. The doctor was stopped, and a number of physical troubles were rehearsed. "Great heavens!" said our Æsculapius in affected alarm, "is that the case? Let me see your tongue." The would-be patient looked around suspiciously, then opened his mouth with some reluctance. "I tell you," said the doctor, with apparent irritation, "put out your tongue. How can I make a diagnosis if I only see the tip? There, hold still! Further! Now close your eyes." The patient, conquered, shut his eyes tightly and thrust out his tongue to the utmost. The doctor stepped around the corner quick as a flash, and was troubled no more for advice *gratis*.

A PECULIAR DIAGNOSIS. — A case of small-pox at Fort Worth, Texas, was diagnosed by the irregular practitioner in attendance as "erysipelas from the toes to the knees, measles from the knees to the waist, and seven-years itch from the waist to the top of the head." In consequence of this diagnosis several persons, who were allowed to visit the patient, contracted small-pox from head to foot.

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REARING OF HEALTHY CHILDREN. — No sanatory fact verified by experience and confirmed by authoritative data has a greater significance than that physical vigor, inherent or acquired, is essential both to the bringing into the world and the rearing of healthy children. Debilitated, sickly women are notably apt to be the mothers of feeble children, and a child nursed by a feeble mother seldom grows up vigorous. Upon the positive and concurrent testimony of physicians, one of the most desirable means of imparting stamina to weakly females is Colden's (Liebig's) Liquid Beef Tonic, prepared after the formula of Baron von Liebig, from the purest Extract of Beef, combined with Iron, Quinine, Gentian, and roots known for their tonic and health-giving properties. This sterling and agreeable tonic and article of food is of inestimable service before and after the birth of an infant. It compensates for the unavoidable drain upon the system, and the infant is benefited when the mother or nurse uses it.

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Prof. Physiology, Hygiene, and Clinical Medicine, Medical College of Indiana, Indianapolis, Indiana.

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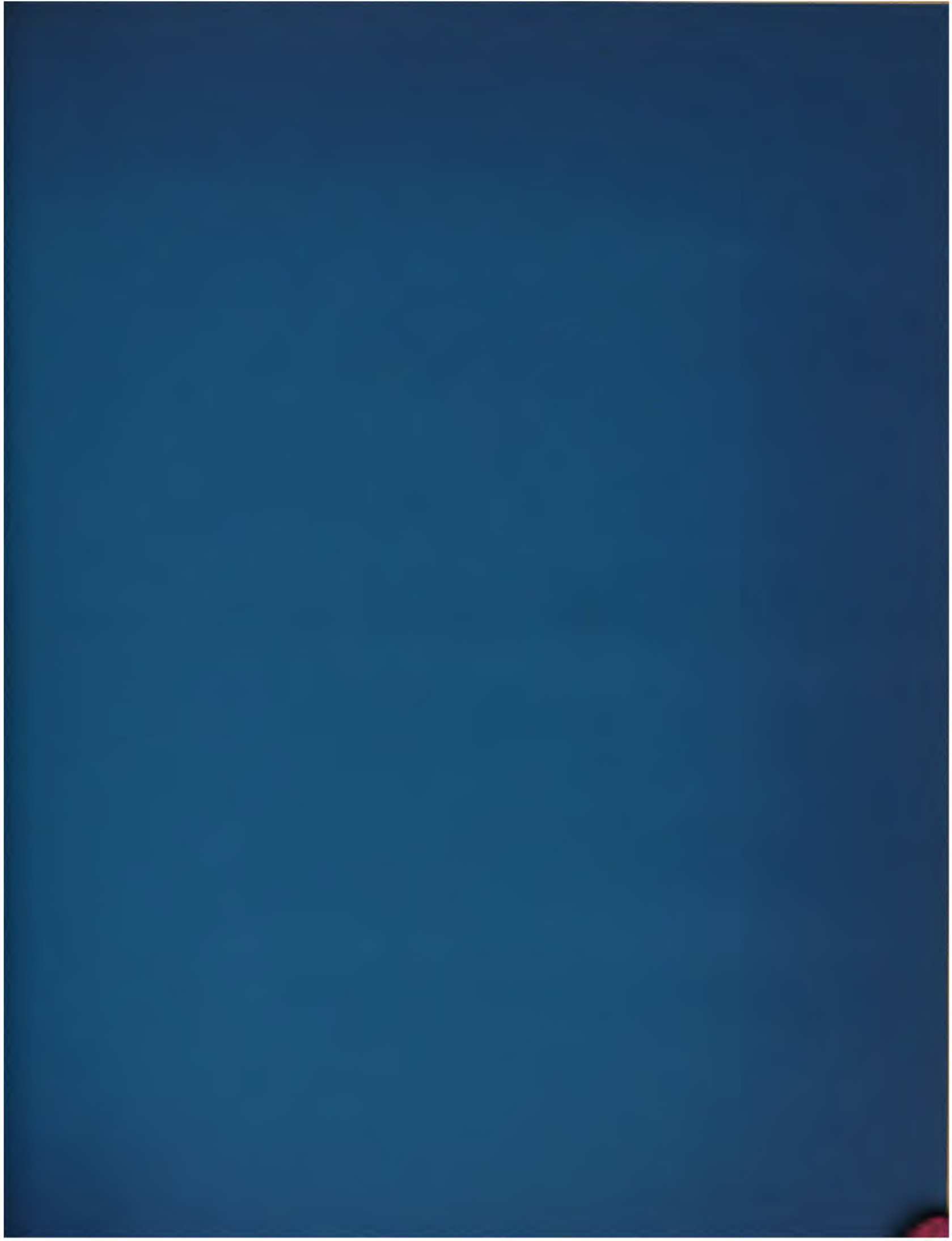
Yours respectfully, C. G. HUBBARD, Hornellsville, N. Y.



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Familiar Science.

WHENCE, WHAT, WHERE?

BELOW are presented some excerpts from the new book, "Whence, What, Where?" a second edition of which has just been published.

MATERIAL MAN.

Man as a whole, studied in his material or chemical relationships, presents no special points which distinguish him from other forms of animated nature. He has been described as nothing more than a few pounds of solids diffused in a half dozen buckets of water, and this empirical statement contains the elements of truth. Considered as a machine, man presents the most wonderful example of superhuman wisdom to be found in the wide universe of matter. In structural design and perfection of parts, the physical man is indeed a marvel of complexity and simplicity. Organic and functional offices are conducted in the system in health with a precision and perfection which cannot be imitated by art. Every functional movement appears to be guided by a superior wisdom, and every process is directed by a subtle chemistry not understood in college laboratories. Passing by the intricate processes of digestion and assimilation, the secretion of the different fluids and the ejection of effete substances from the body, let us look for a moment at the processes by which growth is promoted and the child is raised to the high estate of man. As has been stated, the starting point of a human being is within the limits of a single cell, an object infinitesimally small, but the seat of great activities.

The simplicity of Topsy, in Mrs. Stowe's famous story of "Uncle Tom," has excited hearty laughter from many a reader, but not all have considered the profound philosophy which lurks beneath her intuition in the answer she gives to the inquiry, "Who made her?" The question is a perplexing one not alone to poor ignorant Topsy, but to all those who put such questions. Not having been born, she must have "growed," and in this answer she evades a question the most learned zoölogist is not prepared to solve. She was certain that she "growed," for the careless observation of the simple and ignorant is sufficient to prove that somehow human beings increase in size from year to year, but the *beginning* is covered by a cloud without rift or boundary.

So far as the microscope reveals the nature of the physical and chemical activities involved in the process of growth, we learn that it is a play of affinities which corresponds with molecular motion throughout organic nature. The single cell in which life begins, as it is excited by the fecundating principle, presents a scene of activities corresponding with those observable in a hive of bees during the season when the highest supply of food is furnished by expanding buds and flowers. The vegetable cell affords some distinguishing features, in which chlorophyl, the green coloring principle, plays an important part, but as a whole chemical action is the same. Each cell has a nucleus or central point of life, and around it the molecules of matter are in ceaseless motion. The cell material is organized matter in a highly excited state, and the work carried on is confined to building up cell walls and in laying the foundation for new cell structures. One cell organism rises upon another in the solid parts, and in liquids the cells float about, and perform their functions in an unstable condition. Growth in liquids and solids is by the multiplication of infinitesimal cells, and the material is supplied by the nutriment received into the digestive organs.

When we consider the complexity of the various organs and parts of material man, the nervous and muscular tissues, the blood, the secretions, the brain, the nails, the bones, etc., of the body, and are assured that all comes from similar food material, and from the oxygen of the air, it conveys to the mind profound impressions of mystery. There is in the contents of the hen's egg every material needed to build up the structure of the chick, consisting of bones, feathers, bill, feet, eyes; in short, all the organs and appendages of the little organism.

The period of growth, or that during which increase of mass goes forward, in man, is confined to the first fifteen or twenty years of his existence.

During this period, the necessary waste of tissues continues, and construction and repair go on simultaneously, necessitating a larger supply of material than is needed at other epochs in life. During cell growth, the contour of form is preserved, and uniformity of increase is maintained. One limb, one ear, or one bone does not grow faster than another; the blood is the grand carrier of material, and it circulates everywhere. The little molecules crowd and push their way into the minutest tubes of every part of the growing child, and bring along the carbon, nitrogen, oxygen, lime, and other material needed; and the cells are built up, and they multiply until the mature form of man is perfected.

In the process of growth and in the supply of waste material in the body, we have to study the evolutions and chemical changes of matter, and in material man we have nothing but matter to consider and bring into the field of research. At this point the important inquiry arises, What is matter?

The positive manner in which matter is spoken of in scientific discussion leads one to conclude that it is well understood, and that it is easy to define what it is. In looking out upon the world of matter we see an infinite variety of forms, and to these we have given names, and have learned that each form has its own characteristics, and is marked by peculiar behavior. Matter is attended by phenomena of motion and affinity, which two distinguishing points constitute the whole field of study open to man. There are more than sixty bodies which are distinguishable by their peculiar physical appearance, and by their behavior and reactions. These bodies we call elements; and when these elements group themselves together they are called molecules; and when these molecules combine in mass, a body results which may be solid, liquid, or gaseous, and to which is given a name which distinguishes it from all other bodies. After a most careful study of a body, we are still in the dark regarding what it is. Very many of the most active and wonderful forms which have been studied, and which are supposed to be well understood, have never been seen by the eye of the investigator.

THE DUAL NATURE OF MAN.

Difficult of comprehension as is the dual nature of man, it supplies scarcely greater difficulties than are presented in many of the relationships of different forms of matter. The osseous frame-work of man has a dual nature, and affords a striking illustration of the association of two forms of matter utterly distinct; one belonging to the dead, inorganic world, the other to the organic or living. We have here analogies worth noticing. The spirit of man may be likened to the gelatinous portion of bones, and the body to the calcic or earthy portion, the latter completely masking or hiding the former or living principle. Before the discovery of powerful acids, a century or more ago, no one then living could understand that dry bones contained an organic living principle, distinct from the refractory substance open to the eye. Bone material presents a hard, compact surface and texture closely resembling limestone, to which it is allied. It resists for long periods the action of those disintegrating forces which speedily turn to dust and gases the other portions of the body, and unless the substance is demanded for use in the arts is a waste and troublesome product.

Let us look at the analogies supplied by osseous substances, as illustrating the co-existence of body and spirit. If we take the dry, osseous human skeleton, and place it in a tank of hydrochloric acid, changing the acid as often as it becomes saturated with the calcic element, we find that in a few weeks, or perhaps months, the inorganic portion has entirely disappeared; but there remains, occupying the same space and preserving the same form, a skeleton which is no longer bone. The frame-work of ribs, vertebræ, etc., is no longer opaque and solid, but transparent, and yielding to the touch; the soul, or spirit, so to speak, of the bone structure remains, but the earthy portion has been resolved into other forms of matter. This organic form of the osseous structure of man can be preserved in proper liquids for an indefinite period of time, after the bone has been forced into new chemical combinations.

If we had an agent capable of dissolving the material body of a living man, leaving untouched the spiritual form, so that our natural eyes could behold it in its dissevered state, it would be a revelation but little more wonderful than what has been described. The process called death lifts the spiritual body out of the material without the intervention of solvents devised by human skill; and although we cannot see the act of separation with our visual organs, it may be open to the spiritual eyes of those who have experienced the change.

The remark is often made by educated men that they are entirely unable to entertain conceptions of spirit, or form any idea of its nature or capabilities, and therefore they cherish stolid disbelief in its existence. Such should remember that they are as clearly incompetent to understand the nature of matter and most of the laws by which it is influenced.

A few years ago, before science removed the thick veil which hid from view many of the secrets of nature, mankind were walking amid mysteries which met them at every step. As regards respiration, they did not know anything of the nature of the air, or why it was so perfectly adapted to maintain animal life; they did not know, when a fire was kindled upon the hearth, what was the cause or what the nature of the phenomena of combustion; they did not know or believe that air was a material substance, having weight, like sand or water; they did not believe that water, or one of its elements, was combustible, and that the other was the grand supporter of combustion. These and many other of the secrets of nature were hidden from their eyes and understandings, but not from ours. We can explain and demonstrate a thousand processes and movements in nature which cannot be understood, and if we yield belief to only that which we see and fully comprehend, our field of knowledge is reduced to narrow limits.

There is as good ground for agnosticism in physics as in psychics. A considerable number of the movements and changes in the physical world, which are regarded as well-ascertained facts, are still lingering in the domain of hypothesis. Electricity in itself considered, and much of its attendant phenomena, belongs to the realm of the unknown. We call it force, but after bestowing upon it a name it still remains a mystery.

Considered as a *thing*, we know as much of spirit as we do of electricity. The claim that one is a physical, the other a moral, force is unsatisfactory, as the distinction is clearly indefinable. The physical and spiritual forces are capable of producing like impressions upon matter, and influencing its multiform changes.

Those among the educated classes who speak derisively of the results of biological research, and of some observed occult psychical phenomena, are apt to place in contrast what are called demonstrable facts in physical science, and claim a much clearer insight in that direction than is warrantable. It is hazardous for any one to venture far in bringing to view disparaging contrasts, for it is easy to show that physical science is hedged in by barriers which effectively oppose its progress, and the domain of the unknown is a field whose boundaries are as wide as the physical universe.

WHAT OF DEATH?

Instances of death from purely natural causes are rare. By natural causes is meant death from the normal decay of the vital forces, when metamorphosis of tissue ceases, and the spiritual nature relaxes its hold upon the material, the work of life being accomplished. Fully one half of the human beings who people the earth die from accident, and one half of the remainder from defective organization arising from heredity. Accidents which terminate the physical career of man are not necessarily violent or sudden in their nature. A severe chill, arising from unexpected or unavoidable exposure, which terminates in fatal pneumonia, is of the nature of an accident, and so are sun-strokes, lightning-strokes, malarial fever, etc. All zymotic or germ diseases, which decimate populations, come to individuals from accident of location or exposure. Combatants in war die from accident, rarely from natural causes. Hereditary taint, as a cause of death, fills up wide gaps in our bills of mortality. The imperfect physical organization of a father or mother is transmitted to children with fatal results. The wail of woe which arises in all lands from improper and almost criminal marriage is pitiful enough, one would think, to startle the most careless and indifferent, and lead to devising means to mitigate or remove the evil.

Nature is not always kind, or at least seemingly not so. Her one grand intent of evolving a universal perfection is not carried forward without pains and misery. Progress, or advancement toward the good, is not always attended by happiness. Man only attains the highest good through suffering, and this is a lesson of such universal application it cannot well be overlooked. Moral and physical evil is in the world for a purpose: the purpose being to bring to view, by contrast, the desirableness of the good. Evil is intended to be disciplinary, and it is well to heed its lessons.

There is no evidence to show that nature intended death to be cruel or painful to the mind, or physically painful to the body. The natural man should know no more concerning his own death than his own birth. He comes into the world without the consciousness of suffering, and if the perfect law be fulfilled he will die oblivious to all pains, mental and physical. At his birth he sleeps into existence, and awakens into knowledge; at his death, he dozes into sleep, and awakens to a new life.

Dread of death arises from two prominent causes: fear of physical pain, and uncertainty in regard to what comes after death. The concurrent testimony of all medical men who are called to sit by the bedside of the departing is that mankind entertain greatly exaggerated notions of the suffering in physical death. Notwithstanding, in our present social state, we so frequently thwart Nature and violate her laws, she still vindicates her intentions, and gives true euthanasia to most, and often where it is least expected. No phenomenon in nature is more wonderful than physical death, as the event comes to the notice of physicians under all circumstances incident to the duties of the profession. Death by nature is a kind of waking sleep; the faculties of the mind, without pain, or anger, or sorrow, lose their way, retire, rest. The man, strong in intellect perhaps, is reduced to the instinctive; the consummation approaches; the deep sleep that falls so often is the sleep that knows no waking, and without pain, or struggle, or knowledge of what happens, the disenthralled spirit departs. This is natural death, and of the nature which would befall most if the free will, which has been given, doubtless for wise purposes, did not lead us into antagonism with nature's laws. Sudden and violent deaths are usually painless, or nearly so, although often to the observer they do not seem so. A fall or blow, the passage of a bullet through vital organs, incised wounds, deep into the tissues or viscera, influence instantaneously nerve centres, and partial insensibility occurs, so that if fatal results follow speedily there is but little suffering in the act of death.

In great calamities which befall communities, where numbers perish, the mind is filled with sublime awe, and the emotions are stirred to the utmost, but the bodies subjected to the fatal casualty are so killed that they have not time to know or feel.

In experiments with induction coils of great power, I have frequently, through inadvertency or accident, received powerful currents through the hands and limbs, so that instantaneous temporary unconsciousness occurred. They would have caused death had they been directed to vital parts, and in that event it would have been wholly painless. The fatal force moves so rapidly that impressions of sense have not time to reach the brain before the mind is incapable of acting through the organ, and hence there can be no suffering in death by lightning-stroke. Sudden death is never undesirable, unless it bears heavily upon the sympathies and external condition of survivors.

Death resulting from protracted and hopeless ills, as cancer, consumption, broken heart, etc., is not without its consolations. It is often welcomed, not as an enemy, but a courted friend. We have, in the instance of a distinguished Southern senator dying of cancer, an illustration of the serenity which may come to one under apparently the most deplorable circumstances. In the declaration made by the sufferer, that "he was never happier in his life" than while watching the progress of the disease and waiting for the end, we discover the action of that strange but beneficent law of reciprocity which prevails so widely throughout nature.

There are few evils, or conditions in life, which come under observation, which are not less afflictive to those involved than they seem to the observer. An instance of great apparent affliction came under my notice, where the heads of a family, husband and wife, both in middle life, were sick of incurable diseases in the same room: the husband from suppuration of an encysted bullet in the cavity of the lungs, the mother from cancer of the breast. All the circumstances were sad: the parties were highly intelligent, poor and dependent, the physical suffering was great, and they were among strangers. There appeared to be nothing ameliorating in the cases, but the sufferers were cheerful and even happy. Life was hardly a question of days with either, and yet they were interested in the affairs of the world, in passing events, and continued so to the end, which was painless and peaceful. Like instances are not rare in the experience of every physician.

In lingering death from consumption, painful as it is, even terrible to witness, the action of death, though it may be physically hard, is not usually cruel. It strikes the young largely, in whom the hope of life and the belief in life is strong, and the victim is never without hope of recovery. They live to the final hour in happy plannings of the future, and die in the dream.

The lesson we have to learn is that the Supreme Creator is beneficent even in the act of death; if there is terror, sorrow, it is made sorrow, made terror, and does not come by nature.

IS EVOLUTION GODLESS?

This important question has sometimes been hastily or ignorantly answered in the affirmative. How it is answered by a master of the subject, who accepts the great truths of Christianity as fully as he does the doctrine of evolution, and who can give a reason for both the scientific and the theological faith that is in him, may be seen from the following abstract of Dr. Winchell's lecture on the question: —

The religious nature of man has always manifested a tendency to revolt against any general theory of development in the processes of the world. Such doctrines have been equally opposed among the Greeks, among the religious minds of the Middle Ages, and in our own times. They have never commanded any general assent even among the

purely scientific, until within less than a quarter of a century. Since Charles Darwin pointed out, in 1858, the existence of tendencies in the organic world which would go far to explain the means by which transmutations of species may be effected, thinking minds have generally been led to the belief that evolution is the method of nature; and the protests of the religious sentiments have not been able to stay the progress of opinion.

These protests, it must be particularly observed, are based on the supposition that a method of evolution must be a method of self-evolution. With this understanding religious opposition is inevitable and is right. The religious nature is an original and ineradicable constituent of humanity, and has the same right to exercise as the intellect itself. It means more. The objects toward which its activities are directed must be recognized as realities. They are ultimate truths, as valid as the intuitions of reason. A spontaneous evolution robs these faculties of their object, and they protest. It falsifies an affirmation of the fundamental authority of our being, and must be *an impossibility*.

But such an interpretation of evolution is unnecessary. It cannot be defended. The doctrine of evolution is simply a statement of *fact* concerning the *method* of the succession of events in the natural world. It affirms nothing respecting any efficient connection between the successive terms of the series. It affirms nothing respecting the mode of origination of the first term of the series. It says nothing of beginning, but only of the *mode of continuance*. It is entirely compatible with the supposition that the first term was the product of immediate creation.

But scientific writers speak of causes. They tell us that such and such modifications of structure are produced by such and such conditions or antecedents. How is such language to be reconciled with the statement that evolution has nothing to say about causation? It is important to be borne in mind that the word *cause* is employed in literature in two senses. By cause the scientist means only a uniform antecedent. But every one immediately understands that mere antecedence is insufficient. Some *efficiency* must be exerted in the preceding term which passes over into the following term. There must be a bond connecting the two which is more than simple successiveness. This is the other conception of cause. This is the conception of real and only cause. The scientific conception of cause is merely that of uniform antecedence among material phenomena, and is therefore not a conception of true efficient causation at all.

Now, all real efficiency originates in *will*. Our own experiences teach that every result attained in the realm of human activities proceeds from human volition. Tools, machinery, the elements of nature, — these are only intermedia which will employs for the accomplishment of its ends. All the eminent authorities concur that the same conclusion must be applied to events in the natural world. All its phenomena are the products of some causal volition.

But the mere fact of volitional causation implies much more. The exercise of will implies a real being, possessing such an attribute. The effects to be produced must be first conceived or apprehended. This is an act of intelligence. The suitable conditions must be chosen; appropriate instrumentalities selected. These are other acts of intelligence. The premeditated effect must be desired; there must be a motive for producing it. Motive and desire belong to the emotional nature. Finally, the exertion of will for the effectuation of the result completes the circle of attributes constituting personality, — that is, separate, self-sustained existence. Intellect, sensibility, and will are the three moments of our own personal being.

Now, to apply this analysis to the organic changes which sometimes take place in animals and plants, we must keep clearly before the attention the discrimination between the *fact* of an evolutionary mode of succession, the *conditions* under which it is effected, the *instrumentalities* employed in the effectuation, and the *cause* whose efficiency employs the instrumentalities under the conditions to make a given effect a fact of nature. It is plain that when an animal comes into possession of a modified structure that structure has grown. The result has been attained through the action of the growing forces. A denser covering of fur may have come into existence in connection with the advent of a colder climate. The change in the climate is the *condition* to which the organism becomes adapted, and the changed action of the vital forces produces the adaptation. But the physiological activities within the animal are themselves only instrumental. They are merely physical activities, directed to certain ends. They do a work not planned by the organs. These facts point to the existence of some real cause yet undiscovered. It must be an immaterial cause, since the deepest scrutiny of our microscopes discloses only matter engaged in the physical activities just referred to. It must be an intelligent cause, since it selects and builds according to intelligible plans. Only intellect performs such works. Manifestly, then, some intelligent and immaterial cause employs the physiological forces to build the organism according to certain methods, into such growths as shall be best suited to the external conditions under which the animal lives.

The theological deductions from such a scientific conclusion follow immediately. There must be a first cause. The immaterial cause operative in nature must act *constantly*, not periodically. The world was not created in some beginning, and set running like a clock. Sustaining power is imminent in the world. This view is maintained by eminent authorities in science and philosophy. The cause of the world is possessed of attributes co-extensive with the origination and maintenance of the visible universe. This to us means a body of infinite attributes. But the metaphysical infinity of the first cause is reflected in our necessary intuition of the infinite.

Thus evolution is a world-embracing plan expressive of mind. It lifts us to the highest possible apprehension of the wisdom and power and unity of the Supreme Being, and brings us into the most intimate relations with the Father of All in all the phenomena of the natural world, and all the experiences of our daily lives.

AN ELECTRICAL EXPERIMENT.

A FRENCH journal gives the following experiment: —

A small pasteboard box is provided with a glass lid, which is coated on the upper surface with one or more thin layers of collodion, but not enough to render it opaque. A number of figures representing insects and the like, and made of cotton or sponge, are placed within the box. When now the collodion surface is rubbed with dry fingers in dry weather, the insects are made to move about in an interesting manner, as they become electrified.

A Western exchange describes the same experiment somewhat more minutely thus: —

A shopkeeper, in wiping off boxes that had glass lids, discovered that particles of lint, bits of thread, paper, and the like, flew up from the bottom of the box and attached themselves to the glass, moving about as though they were alive. Further experiment showed him that the same thing took place in the show-cases, when the glass of the tops was rubbed with a handkerchief, but on a larger scale. He made butterflies and other insects, some three inches long and two inches wide, of colored paper, also little balloons and a great many other things, which, being placed in a show-case, performed in a really comical manner when the glass was briskly rubbed. The air here being dry and light, no collodion coating is required. The show-cases used in the experiment were eight or ten inches in depth, yet the artificial insects would readily hop from the bottom up against the glass, and dart about from place to place. Often an insect would be seen to leave its place, swoop down almost to the bottom of the case, then rise and attach itself to the glass at another point from one to two feet away from where it had its first hold. Sometimes two or more of the insects would be seen to suddenly dart at one another, cling together, and fall to the bottom of the case, as though fighting; and on touching the bottom of the case they would separate, and, darting back, take new places on the glass. When a lot of small insects made of the bright, artificially-colored mosses imported from Europe are used, the effect is very fine, and those who see the experiment for the first time can hardly be made to believe that the bugs, worms, butterflies, and moths are not alive. The effect may be produced (in this climate) by laying a pane of glass upon the lid of any ordinary paper box. The changes are almost as many and curious as those seen in a kaleidoscope.

THE MONKEY AND THE SUGAR.

A RECENT English writer gives the following illustration of the sagacity of animals, which will interest our young readers, if not their elders as well: —

I remember once, in India, giving a tame monkey a lump of sugar inside a corked bottle. The monkey was of an inquiring mind, and it nearly killed it. Sometimes, in an impulse of disgust, it would throw the bottle away, out of its own reach, and then be distracted until it was given back to it. At others it would sit with a countenance of the most intense dejection, contemplating the bottled sugar, and then, as if pulling itself together for another effort at solution, would sternly take up the problem afresh, and gaze into it. It would tilt it up one way, and try and drink the sugar out of the neck; and then, suddenly reversing it, try to catch it as it fell out at the bottom.

Under the impression that it could capture it by a surprise, it kept rasping its teeth against the glass in futile bites, and, warming to the pursuit of the revolving lump, used to tie itself into regular knots round the bottle. Fits of the most ludicrous melancholy would alternate with spasms of delight, as a new idea seemed to suggest itself, followed by a fresh series of experiments.

Nothing availed, however, until one day a light was shed upon the problem by a jar of olives falling from the table with a crash, and the fruit rolling about in all directions. His monkeyship contemplated the catastrophe, and reasoned upon it with the intelligence of a Humboldt. Lifting the bottle high in his paws, he brought it down upon the floor with a tremendous noise, smashing the glass into fragments, after which he calmly transferred the sugar to his mouth, and munched it with much satisfaction.

SCIENTIFIC BREVITIES.

HOW FLIES CLIMB. — Herr H. Dewitz has communicated to the Berlin Society of Natural History some facts that bear very strongly against the generally received theory that flies adhere to perpendicular walls and ceilings by virtue of some sucking power in their feet. He asserts that the feet of flies cannot possess the sucking property ascribed to

them, for they are hard and destitute of muscles. The theory has long been contradicted by the experiments of Blackwell, who found that flies could climb the sides of a jar under the receiver of an air-pump, where there was no atmospheric pressure, and who asserted that the power of adherence was due to a sticky matter secreted from the foot-hairs of flies. This assertion was generally regarded as not proved, and the case has rested there. Dewitz reports that his investigations have shown that Blackwell was right. He has watched the exudation of the sticky matter from the feet of the flies by fastening one of the insects to the under side of a plate of glass, and viewing it under the microscope. A perfectly clear liquid was seen to flow from the ends of the foot-hairs and attach the foot to the glass. When the foot was lifted up, to be put down in another place, the drops of the sticky matter were perceived to be left on the glass, in the exact places where the foot-hairs had rested. The adhesive fluid appears to pass down through the hollow of the hair, and to be derived from glands which Leydig discovered in the folds of the foot in 1850. A similar adhesive matter appears to be possessed by bugs, by many larvæ, and probably by all insects that climb the stems and the under sides of the leaves of plants.

The Possible Increase of Animal Life. — In discussing this subject, Darwin says, "There is no exception to the rule that every organic being naturally increases at so high a rate that, if not destroyed, the earth would soon be covered by the progeny of a single pair. Even slow-breeding man has doubled in twenty-five years, and at this rate in a few thousand years there would literally not be standing room for his progeny. Linnæus has calculated that if an annual plant produced only two seeds, — and there is no plant so unproductive as this, — and their seedlings next year produced two, and so on, then in twenty years there would be 1,000,000 plants. The elephant is reckoned to be the slowest breeder of all known animals, and I have taken some pains to estimate its probable minimum rate of natural increase. It will be under the mark to assume that it breeds when thirty years old, and goes on breeding till ninety years old, bringing forth three pair of young in this interval; if this be so, at the end of the fifth century there would be alive 15,000,000 elephants, descended from the first pair."

Science for the Young. — The *Philadelphia Medical Times* has found some choice reading in a small manual used for children of eleven or twelve years old in the schools of Manchester, England. In one of them "the author explains scientifically the things of common life. Youths of twelve are quite ignorant of what jumping means. He tells them, 'jumping or leaping is effected (1) by the sudden contraction of the muscles of the calf, by which the heels are suddenly raised and the body jerked off the ground; (2) by the simultaneous contraction of muscles which bend the thigh upon the pelvis; (3) by the sudden extension of the legs by the contraction of extensor muscles, this movement following immediately on the two movements first described.'" Should this be called condensed milk for babes?

A Photo-Electric Battery. — A series of experiments has led a French chemist (M. Saur) to the construction of an electric battery which gives a current only when exposed to light. The battery, which is described in *L'Ingénieur*, consists of a square glass-vessel, with a solution of 15 parts of marine salt and 7 of sulphate of copper in 100 of water. This has an electrode of sulphide of silver. An inner porous vessel with mercury has an electrode of platinum. The electrodes are connected with a galvanometer, and the battery is placed in a box, with the light excluded. Closure of the circuit displaces the needle, the sulphide of silver being the negative. When the needle is at rest, exposure of the battery to solar light causes further deflection, the extreme sensitiveness of the battery being shown by the fact that the passage of a cloud causes a variation. The effect of the battery is due to the mercury being attacked by the bichloride of copper formed by the mixture of marine salt and sulphate of copper. The proto-copper formed reduces the silver sulphide; but this reduction requires the intervention of solar light, which produces a photo-electric current. We do not know whether this photo-electric battery has been tried as a recorder of sunshine, but if it is as sensitive as represented it should be of some value in this direction.

Daily Variations in Stature. — Dr. Merkel states that the height of an individual after a night's rest, measured before rising from the bed, is two inches greater than it is in the evening, measured standing. There is a gradual diminution in height, caused by the yielding of the plantar arches and of the intervertebral discs; and a sudden diminution, when the individual rises, occurring at the articulations of the lower extremities. The sinking at the ankle is $\frac{1}{8}$ inch; at the knee, $\frac{1}{12}$ to $\frac{1}{8}$ inch; at the hip, $\frac{2}{8}$ inch. The shortening at the knee is probably due to the elasticity of the cartilages. At the hip there is, in addition, a sinking of the head of the femur into the cotyloid cavity.

Practical Chemistry and the Arts.

LIQUID GLUE.

It has long been known that the addition of a small quantity of acid to a solution of glue would impart to it the property of remaining liquid, acetic and nitric acids being commonly recommended. It is customary to put the glue in water until it swells up; then melt it with as gentle heat as possible, and carefully add acetic acid or strong vinegar, until a sample taken out and tested does not harden on cooling. Such liquid glue must be kept carefully corked, or the acid will evaporate, and permit the glue to harden.

A few months since we had occasion to use some glue, and attempted to make the liquid glue by the easiest and least promising of processes. A few pieces of carpenter's glue were broken up and thrown into a wide-mouthed bottle, covered with common vinegar, and corked. In a short time, with occasional shaking, they dissolved, forming a very strong and excellent glue, superior to most of the liquid glues sold in the stores. Sometimes the cork is left out, and evaporation takes place; but it is only necessary to add a little vinegar, cork and shake it, when it will soon be ready for use, just as gum-arabic mucilage that has dried up is restored by the addition of water, only more quickly and effectively. Its strength is certainly not inferior to hot glue, while it is *always ready*. It possesses, however, one disadvantage: if tightly corked, the cork becomes glued fast, and is not very easily removed, while if the cork is not put in tightly it evaporates rapidly.

A German paper gives the following more tedious process for making a better article, which shall be clear and white, and keep well without drying out: 100 parts of gelatine and 6 or 7 parts of oxalic acid are dissolved in 400 parts of water (all by weight), and the solution digested several hours in steam in a porcelain vessel; then diluted, neutralized with chalk, filtered, and evaporated at moderate heat, until its weight is but twice that of the gelatine used.

Mouth glue, for sticking labels, etc., is less used than formerly, owing to the general introduction of adhesive labels, envelopes, newspaper wrappers, etc. It is, however, very convenient to carry in the vest pocket when travelling, and adhesive wrappers may not be at hand when wanted. To prepare it, good white glue is soaked several hours in water, then melted on a water-bath, and an equal weight of sugar added. The hot mixture is poured out and dried in thin sheets. A good proportion is 45 parts (by weight) of light glue, 60 of rain-water, and 45 of white sugar.

For water-proof glue dissolve caoutchouc in naphtha, and add pulverized shellac to the proper consistence (used hot); or strips of crude rubber may be dissolved in warm copal varnish (for wood and leather); or 340 parts of glue may be dissolved in a sufficient quantity of water, 85 parts of rosin melted up with it, and 4 parts of turpentine added.

PARCHMENT PAPER.

It is well known that when unsized paper is immersed for a short time in a mixture of sulphuric acid and water (two parts of acid to one of water by bulk), and then washed with dilute ammonia, it undergoes a peculiar change of properties without suffering any change of chemical composition. It is now very tough, and is called vegetable parchment. We learn from the *Apotheker Zeitung* that a company is being formed in New York to undertake its manufacture, as at present there is no manufactory in this country. The factory is to be in the neighborhood of that city. The paper is made both white and in various colors, and of six grades of thickness. It has the following uses: —

(1.) As a substitute for leather and bladder in wrapping perfumery, preserved fruits, extracts, salves, etc.

(2.) For ice-bags, labels, and similar articles.

(3.) Large quantities of it are consumed by the manufacturers of cheese, preserves, pressed yeast, etc., to pack their wares.

(4.) A considerable quantity is used for chemical purposes, such as dialysis and osmose, and for dynamite cartridges.

(5.) Parchment paper is used to line barrels for holding deliquescent substances that soak into the wood, such as tin salts, also butter and lard.

(6.) Parchment paper is found to be a practical substitute for tracing-paper and tracing-cloth.

(7.) Beside its ancient use as writing-paper for important documents, is its use in book-binding.

(8.) When made extra soft it finds use in hospitals as a substitute for gum elastic, as it can be washed and is durable.

(9.) Parchment paper has long been used to make "cases" for sausages, instead of intestines. The difficulty of pasting it together was overcome by using a chromated gelatine cement, which hardens in the light. H.

ESTIMATING THE FERTILITY OF SOILS.

In a previous number of the Journal we described the best methods of analyzing soils, and spoke of the difficulty of judging of their fertility from a mere chemical analysis. Prof. A. Vogel of Munich, is of the opinion that a sufficiently accurate estimate of the quality of a soil can be formed by determining two constituents, — the phosphoric acid and the organic matter. He takes 100 parts of the earth, and digests it for 24 hours with 200 parts of dilute acetic acid. The solution is filtered and molybdate of ammonia added; if no precipitate forms on standing,

the amount of phosphoric acid is too small and the soil is poor. In comparing two soils, the relative organic matter is found by filtering a little water through the soil, and then titrating the filtrate with permanganate of potash solution. This, of course, is a rough approximation, and we give it for what it is worth.

CHEMICAL NOTES.

Obtaining Oxygen from the Air. — A method of obtaining oxygen from air for technical purposes has been recently devised and patented by M. Margis, of Paris. The principle is that of dialysis, or diffusion under pressure. Atmospheric air being forced against a caoutchouc membrane by suction, a mixture of about 40 per cent. oxygen and 60 per cent. nitrogen is obtained on the other side. A second membrane increases the proportion of oxygen to 60 per cent., that of the nitrogen being reduced to 40 per cent. A third gives 80 per cent. oxygen; a fourth, 95 per cent. M. Margis prepares his membranes by immersing taffeta in a solution containing carbon disulphide(or light petroleum ether), spirit of wine, ether, and caoutchouc. After drying, the taffeta has a fine layer of caoutchouc on it. A bag of the membrane, with frame-work of rings of galvanized iron wire, is placed in a cylindrical iron vessel admitting air. It is connected by means of strengthened caoutchouc tube with the suction apparatus, which is (preferably) formed of a cylinder containing a series of conical cups, with small spaces between; steam is forced through these, and draws in the gas obtained from the first diffusion, passing on with it through a cooler, where the steam is condensed and the gas separated for its second diffusion. This latter occurs through a similar apparatus, except that the space round the bag is provided with a tube passing down into water; thus the pressure can be regulated, and the superfluous gas let off. Four sets of apparatus are generally used (as already indicated), and the final gas with 95 per cent. oxygen is collected in a gasometer.

A Curious Accident with Hydrogen. — It is well known that zinc, in acidulated water, is oxidized and liberates the hydrogen of the water; but not so well known that a like action occurs, though more slowly, of course, when zinc is in water containing carbonic acid, even rain-water. A curious accident, arising from this action, lately occurred to M. Sébère, in Saint Brieuc. He has been long used to keep oxygen in a gasometer of galvanized iron, of 100 liters capacity, sunk in water. Several weeks recently passed without his using the apparatus, in which there were 30 to 40 liters of gas; and during this time the hydrogen resulting from decomposition of the water by the zinc in the interior of the bell sufficed to produce a detonating mixture. M. Sébère, supposing only oxygen to be present, opened the stopcock at the top to admit a jet of that gas to a flame, whereupon the gasometer exploded, fracturing his right hand, inundating the laboratory, and doing considerable mischief to it. The gasometer contained an abundant deposit of carbonate of zinc, and the author assured himself, by means of a test-tube filled with small fragments of the metal and inverted over the water, that the production of hydrogen goes on with considerable rapidity. He now thickly varnishes the interior of the bell.

Test for Atropine and Daturine. — If a specimen of either atropine or daturine, or of their salts, be covered with a little fuming nitric acid, evaporated to dryness on the water-bath, and when cold moistened with a drop of a solution of caustic potassium in absolute alcohol, a violet color is at once produced, which soon passes into a fine red. The violet color only is characteristic, since strychnine, when similarly treated, gives the red. One millionth of a gram of atropine sulphate can be thus detected. None of the other alkaloids act similarly.

To Detect Lead in Tin-Foil. — Frequently it is important to know whether there is lead in "tin" paper or foil. This is the method given for its detection, in a leading foreign technical journal: A drop of concentrated acetic acid is let fall upon the suspected leaf, and a drop of a solution of potassium iodide is added. If there is lead present, there is formed in two or three minutes a yellowish spot of lead iodide. Dr. Kopp moistens the leaf to be examined with sulphuric acid. If the tin is pure, the spot remains white, but if lead is present there is a black spot.

The Atomic Weight of Uranium. — Clemens Zimmerman has prepared metallic uranium, and determined some of its properties. Its specific gravity was found to be 18.685, and its specific heat between 99° and 0° is .02765. The latter number multiplied by 240 gives a product of 6.64, which agrees with the mean atomic heat indicated by Dulong and Petit's law. The controversy between the values 120, 180, and 240 for the atomic weight of uranium is thus settled in favor of the highest.

MEMORANDA IN THE ARTS.

Instantaneous Photography. — The method by which Muybridge took his instantaneous photographs of horses while racing is thus described. At one side of the track is a long building, containing a battery of 24 cameras, all alike, and standing one foot apart. On the other side of the track is a screen of white muslin and a footboard. The screen is marked with vertical and horizontal lines, and the footboard bears numbers indicating intervals of one foot each. The instantaneous shutters of the cameras are operated by electricity, and their movement is governed by such powerful springs that the exposure is estimated to be about one five-thousandth of a second. The contact by which the shutters are sprung is made by the breaking of a thread drawn across the track at about the height of a horse's breast, there being one thread for each camera. In his flight through the air, therefore, he brings each of the 24 cameras to bear upon him at the moment when he passes in front of it, and that camera represents his position at that moment.

To Protect Iron from Rust. — A new process for preserving iron is described by *Les Mondes*. It consists of treating the casting with dilute hydrochloric acid, which dissolves a little of the metal, and leaves a skin of homogeneous graphite, holding well to the iron. The article is then washed in a receiver with hot or cold water, or cooked in steam, so as to remove completely the chloride of iron that has been formed. Finally, the piece is allowed to dry in the empty receiver, and a solution of caoutchouc, gutta percha, or gum resin in essence of petroleum is injected, and the solvent, afterward evaporating, leaves a hard and solid enamel on the surface of the iron-work. Another plan is to keep the chloride of iron on the metal instead of washing it off, and to plunge the piece into a bath of silicate and borate of soda. Thus is formed a silicoborate of iron, very hard and brilliant, which fills the pores of the metal skin. As for the chlorine disengaged, it combines with the soda to form chloride of sodium, which remains in the pickle.

John Bull taking Lessons of Yankee Machinists. — The English manufacturers have adopted the shape of the American axe, as the only way in which they can successfully compete with the American axe makers in foreign markets. They have also pursued this course in respect of many other manufactures. Their latest and most important imitation is that of the American locomotive. A prominent firm at Newcastle-on-the-Tyne has already shipped two engines of the American type to Newfoundland, for use upon a new railway just opened there, and a third is now being finished for the same destination.

London Railroads. — London contains 14 strictly terminal railway stations, from which no fewer than 2202 trains depart daily, and nearly 1600 of these leave between the hours of 10 A. M. and 10 P. M. The largest number of departures from a single terminus is 320, after which come two stations, with 312 and 295 respectively. These figures are exclusive of the immense system supplying the city with local transit.

PRACTICAL RECIPES.

Crystalline Surface on Cardboard. — The substance generally used for this purpose is the acetate of lead, commonly called sugar of lead; but inasmuch as it is poisonous, it is not to be recommended, as it is liable to become the cause of accidents. Better formulæ are the following, suggested by the late Professor Boettger, which afford a brilliant crystalline surface on wood, paper, etc.: Mix a very concentrated cold solution of salt with dextrine, and lay the thinnest possible coating of the fluid on the surface to be covered with a broad soft brush. After drying, the surface has a beautiful bright mother-of-pearl coating, which, in consequence of the dextrine, adheres firmly to paper and wood. The surface may be made adhesive to glass by going over it with an alcoholic shellac solution. Beautiful crystalline coatings may be produced on wood or on sized or glazed paper by the use of the following salts: sulphate of magnesia, acetate of soda, and sulphate of tin. Colored glass thus prepared gives a good effect by transmitted light.

Writing on Metals. — Take half a pound of nitric acid and one ounce muriatic acid. Mix and shake well together, and then it is ready for use. Cover the place you wish to mark with melted beeswax; when cold, write your inscription plainly in the wax, clear to the metal, with a sharp instrument. Then apply the mixed acids with a feather, carefully filling each letter. Let it remain from one to ten hours, according to the appearance desired; then wash and remove the wax.

Blue Marking Ink for White Goods. — Dorvault recommends the following: —

Crystallized nitrate of silver	1 drachm.
Water of ammonia	3 drachms.
Crystallized carbonate of soda	1 drachm.
Powdered gum arabic	1½ drachms.
Sulphate of copper	30 grains.
Distilled water	4 drachms.

Dissolve the silver salt in the ammonia; dissolve the carbonate of soda, gum arabic, and sulphate of copper in the distilled water, and mix the two solutions together.

Removing Ink Spots. — According to an Antwerp pharmaceutical journal, the best plan is to use a phosphate of soda, first of all spreading a few drops of melted suet over the ink-spot, and then washing the substance in the saline solution until the spot disappears.

Flour Paste. — The following is commended for this purpose: —

Flour	4 ounces.
Water	1 pint.
Nitric acid	40 minims.
Oil of cloves	5 "
Carbolic acid	5 "

Thoroughly mix the flour and water, strain through a sieve, add the nitric acid, apply heat until thoroughly cooked, and when nearly cold add the oil of cloves and carbolic acid.

This makes an excellent paste for all pharmaceutical uses. In dry climates the addition of about 5 per cent. of glycerine prevents it from drying up too

soon in the mucilage-pot, when used on the prescription counter.

PAPER FOR TAKING OUT INK STAINS. — Thick blotting paper is soaked in a concentrated solution of oxalic acid and dried. Laid immediately on a blot, it takes it out without leaving a trace behind.

Agriculture.

A FARMERS' SCHOOL.

THE need of elementary instruction in chemical and other branches or departments of science which have a special bearing upon husbandry is widely felt among farmers. Again and again have we insisted, in public lectures, in discussions, and in the columns of the JOURNAL, that the right method to advance useful knowledge among farmers has not yet been adopted. We have insisted that our agricultural literature, especially that part which presents the results of scientific research and experiment, is not read, or if read is not understood, by farmers. They have not the necessary elementary knowledge of the sciences to enable them to understand the most valuable portion of our agricultural literature.

It has been urged by our esteemed and learned associates in the various departments of instruction that it is useless to attempt to educate the practical working farmer; that all our efforts must be spent in educating the boys who are born upon the farms. It is impossible to concede the truthfulness of this position. We believe the farmers can be brought under a form of instruction, without a large expenditure of time or money, which will fit them to pursue their vocations successfully, and help to elevate and improve American husbandry.

It is well to educate the boys, but we must not neglect the fathers, who are longing for a kind of knowledge not imparted by ordinary lectures, discussions, or institutes. What is needed is elementary scientific instruction, presented in a clear, plain, concise way, and every point illustrated by experiment and example. This is just what is needed.

For several years it has been our intention to open a school of this nature during the winters, the term extending over a few days or a week, and made free to all. The obstacles have been of a personal nature, — impaired health and the pressure of absorbing cares. The plan has not, however, been abandoned, and, if circumstances favor, we shall make the experiment during the present winter, probably during the month of February. Every facility and convenience will be furnished to make the school a pleasant and profitable one. As soon as the programme is fixed upon, it will be made known through the agricultural press. We do not promise the school positively, but hope that no obstacles will spring up to prevent.

ROCK PHOSPHATES.

THE inquiry is often made if the native phosphates in fine powder, which are found upon the market, have any value when applied directly to soils. The experiments which we have made with these substances at our experimental farm go to show that they have a positive value when applied to soils which are *rich in humus*, but on sandy, silicious soils they fail utterly. It is not well for farmers to use them unless they have deep and rather moist loamy soils, abounding in humus. On meadows, or on the land contiguous to meadows, they exert a decided influence for good, but it is not seen until the second or third year. We are inclined to think that the full influence of the phosphatic principle may be secured upon lands of the nature indicated, and that the preliminary dissolving in mineral acids is not necessary. Our experiments indicate that the insoluble phosphates are made soluble and available to vegetation by the various acids arising from vegetable decay.

The powdered phosphate is sold on the market at a low price, about ten or twelve dollars a ton, we believe, and its use should be encouraged by those farmers who understand its nature and the soils to which it is adapted.

EUROPEAN AGRICULTURAL SCHOOLS.

WE learn from the *Report of the Commissioner of Education* that Austria supports no less than 70 schools of agriculture, with 2200 students, beside 174 agricultural evening schools, with 5500 students. In contrast with this, Italy has three agricultural colleges and high schools. Ireland is the only part of the United Kingdom that has a regular system of agricultural education. There are 115 of the national schools that have a farm attached, and form national agricultural farm schools. There are, beside, 16 national model agricultural schools, with model farms attached. The Albert Institute at Glasneven is the national agricultural college of Ireland.

France has 43 farm schools, with about 30 or 40 pupils at each. The government pays the board of each pupil, and allows him 70 francs a year for clothing. There are also three departmental schools of agriculture, and a National Agricultural Institute (now in Paris).

Germany has at present over 150 schools of agriculture, horticulture, arboriculture, viniculture, etc. Each of these has farms, gardens, etc., attached. The first experimental agricultural station was established in 1852, and in 1877 their number was 55. Each of these is devoted to some special line of research.

LIGHT AND AIR FOR HOUSE PLANTS.

THE following sensible hints on this subject are from an interesting series of articles on "House Plants," by Mr. W. M. F. Round, which recently appeared in the *Christian Union*: —

Plants will not grow without light, and will not thrive without fresh and pure air. But some plants require less light than others, and some will do perfectly well without any sunshine. A knowledge of varieties, of the habits and requirements of plants, is essential to the success of the window garden. Go to nature for this knowledge. Nature never makes a mistake. Her hints may be trusted implicitly. Find out in what relations to sunshine and moisture plants grow in their native conditions. The primrose, nestling under hedges where its leaves are sheltered from the sun and protected from the dew, where its roots dip into the moisture of ditches, tells us that we must not let our primrose pots stand too fully in the sun, nor drench the leaves, nor let the roots dry up. The cactus, growing in hot sand plains, in climates where the rain falls one half the year, and the sun shines fiercely the other half, has a lesson on its own leaves for those who would be successful in the treatment of cacti. Most of the palms grow in forest jungles in the tropics, and manifestly heat, moisture, and shade are the requirements for palms, with fibrous earth full of decaying vegetable matter for their roots. So with all plants; one must know them intimately to entice them to their best expression in the window garden. All plants do not need sunshine; so if you have no sunny windows, do not despair of having pretty plants. Ferns, many of the palms, tradescantia or "wandering Jew," ivies, and lycopodium do not need the sun. Fuchsias, begonias, lily of the valley, need but little sun, and many of our loveliest wild flowers grow best when partially shaded. But all plants require fresh, pure air. Most plants thrive best in moist air. Gas is fatal to plants. These facts should be kept in mind. Many a drooping plant is crying out for air, and not for the deluge of water that you pour about its roots. Leaves drink as well as roots. And if leaves drink they must not only have good moist air to drink, but they must be kept clean, so that their mouth-pores may be able to take it in. A growing plant needs as much washing as a growing baby. Smooth-leaved plants need more washing than those that have rough leaves. The rough-leaved plants have their pores protected from the dust by little forests of minute hairs; many of them need no wetting, but the dust should be frequently blown from them with the bellows or the breath. Plants that are growing need much more air and water than plants that are resting. Most flowering plants exhaust themselves in blooming. When the last blossom has fallen the pot may be taken from the window and set in an out-of-the-way corner. There it will rest for a while. Then it will have a period of root growth, and by and by new shoots and leaves will appear, which is a sign that it is ready for blooming again, and it may be placed once more in the full light of the window.

GRAIN AND MEAT IN EUROPE.

A PAPER on "Agricultural Statistics," read by Mr. William Botly at the meeting of the British Association, contained some interesting facts concerning the food supply of Great Britain and the Continent, which are thus summarized in a London journal: —

At present the food supply produced in Europe is equal to about eleven months' consumption, but in a few years the deficit will be, instead of thirty days, nearer to sixty days. As matters now stand, the production and consumption are as follows: Grain, consumption in the United Kingdom, 607,000,000 bush.; Continent, 4,794,000,000 bush.; total, 5,401,000,000 bush. Production of the United Kingdom, 322,000,000 bush.; Continent, 4,736,000,000 bush.; total, 5,058,000,000. Meat, consumption in the United Kingdom, 1,740,000 tons; Continent, 6,372,000 tons; total, 8,112,000 tons. Production of the United Kingdom, 1,090,000 tons; Continent, 6,229,000 tons; total, 7,319,000 tons. It appears that the bulk of the deficit belongs to Great Britain, but as the Continent is unable to feed its own population, we must in future look rather to some other hemisphere for the needful supply than to the supposed surplus that Russia, Hungary, Holland, or Denmark will have for disposal.

Europe paid last year £35,000,000 sterling for meat from beyond the seas, and £85,000,000 sterling for grain, together equal to a tax of £10,000,000 sterling per month. This may give some idea of the magnitude the question of food supply has assumed in the destinies of this quarter of the globe. In the United Kingdom the importation of meat, including cattle, has risen as follows: 1860, 91,230 tons; value, £4,390,000; per inhabitant, seven lb. 1870, 144,225 tons; value, £7,708,000; per inhabitant, 10 lb. 1880, 650,300 tons; value, £26,612,000; per inhabitant, 40 lb.

The consumption of meat in the United Kingdom is much larger than in any other part of Europe. In fact, our home-grown supply is sufficient to give us as much as the average for Frenchmen or Germans, as shown in the following table: —

	Meat Production per Inhabitant.				Consumption.
	Beef.	Mutton.	Pork.	Total.	
	lb.	lb.	lb.	lb.	lb.
United Kingdom	34	19	6	69	109
France	34	12	9	55	70
Germany	40	11	10	61	66
Russia	30	12	7	49	47
Austria	36	10	11	57	58
Italy	18	4	8	20	18
Spain and Portugal	19	17	14	50	48
Holland	51	5	6	62	48
Belgium	33	3	8	44	74
Denmark	90	17	17	124	76
Sweden and Norway	56	10	4	70	70
Roumania	34	18	19	66	59
Europe	34	12	9	55	60

STABLE HINTS.

THE following, from *Whip and Spur*, will be useful to all our readers, agricultural and other, who keep horses: —

(1.) Let your stable be well drained and sufficiently lighted. The vapors from a damp, putrid floor, and the sudden change from darkness to light, will almost to a certainty cause blindness. (2.) Let the floor of the stalls be quite flat and level. Standing on a sloping place is very painful, and causes lameness by straining the ligaments and membranes. It also produces grease and sore heels. (3.) Every stall should be at least six feet wide and nine feet long. This will enable the horse to turn round without bruising himself, and to lie down and stretch himself with comfort. (4.) Let the stalls be separated by partitions, not by bars. They prevent the horses from fighting and kicking each other. (5.) Let proper openings be made just under the ceiling, to permit the hot, foul air to escape, and proper openings at the bottom of the wall to admit fresh air. Impure and confined air will cause broken wind. (6.) The fresh air should enter through a number of small holes, rather than a large hole, such as an open window. That prevents draughts, which cause chills and coughs. (7.) The temperature of a stable should be that of a sitting-room or parlor; not over seventy degrees in summer, nor under forty-five degrees in winter. Hot, close, or foul stables will bring on glanders or inflammation, while a very cold or damp one may cause an incurable cough, or disease of the lungs. (8.) Do not keep the hay over the manger. The steam and breath of the animal make it both unpleasant and unwholesome. If the hay must be kept over the horse, the ceiling between should be of plaster. This will in some measure prevent vapors from passing up to the food. (9.) Have no opening into the manger from the hay-loft. Dust is very often thrown into the horse's eyes when fed in this way, and thus blindness is begun. The breath ascends directly to the food through the opening, which, at the same time, pours a continual draught down on the horse's head, thus causing chills, as well as bad food.

GLEANINGS.

FRUIT-TREE CULTURE. — The *Canada Farmer* gives this concise lecture on the care of fruit-trees:

(1.) Instead of "trimming up" trees, according to the old fashion, to make them long-legged and long-armed, trim them down, so as to make them even, snug, and symmetrical.

(2.) Instead of manuring heavily in a small circle at the foot of the tree, spread the manure, if needed at all, broadcast over the whole surface, especially where the ends of the roots can get it.

(3.) Instead of spading a small circle about the stem, cultivate the whole surface broadcast.

(4.) Prefer a well-pulverized, clean surface, in an orchard with a moderately rich soil, to heavy manuring and a surface covered with a hard crust and weeds and grass.

(5.) Remember that it is better to set out ten trees, with all the necessary care to make them live and flourish, than to set out a hundred trees, and have them all die from carelessness.

(6.) Remember that tobacco is a poison, and will kill insects rapidly, if properly applied to them, and is one of the best drugs for freeing fruit-trees rapidly of small vermin; and is better used in this way than to make men repulsive and diseased.

THE PHILOSOPHY OF PRUNING. — In a French work on pruning, translated by Professor Sargent, the following rule is given: "Their system is based on the fact that, as wood is alone formed by descending, elaborated sap, a wound made on a tree can only be recovered with healthy, new wood, when its entire circumference is brought into direct communication with the leaves by means of the layer of young and growing cells formed between the wood and the bark. To make this connection it is necessary to prune in such a manner that no portion of an amputated or dead branch shall be left on the trunk. The cut should always be made close to and perfectly even with the outline of the trunk, without regard to the size of the wound thus made. This is the essential rule in all pruning, and on its observance the success of the operation depends."

A FRENCH SCHOOL OF INSECTOLOGY. — The city of Paris has granted the Society of Agriculture and Insectology a piece of ground in the park of Montsouris, for formation of a school of insectology. This will comprise the study and practical treatment of useful insects (bees, silkworms, etc.), the study of auxiliary insects (useful to plants), and investigation of the best means of combating noxious insects. Already the society has provided lectures this year, on bee culture, in the Luxembourg Garden; these will be repeated at Montsouris, where an experimental apiary is constructed. Erelong, instruction about silkworms will be given, and a silkworm nursery, with mulberry-trees, formed. For the study of auxiliary and noxious insects, a building is required to accommodate collections and apparatus, and will probably soon be erected.

PROFITABLE FARMING. — A Baltimore man, who bought a farm two or three years ago, was recently approached by a friend who had some money to invest, and who asked, —

"Can I buy a pretty fair farm for $15,000?"

"Yes, about that figure."

"And I'll want to lay out about $10,000 in improvements, I presume?"

"Yes, fully that."

"And I can invest another $10,000 in blooded stock?"

"I think you can."

"And $5000 more in grading, filling up, creating fish ponds, and so forth?"

"Well, you may get through with that sum."

"That 's $40,000; and now let 's figure the income."

"Oh, you don't need pencil or paper," said the victim, as a shade of sorrow darkened his face. "The income will be about $3 for turnips, $2 for potatoes, $5 or $6 for corn, and a bull calf or two at $3 a head. To save time, call it $25. I 'll see you again in a day or two. May be I 've forgotten something which will add a dollar more. Morning to you."

BEWARE of "chaffing" a chemist, for he always has a retort ready.

Boston Journal of Chemistry.

JAS. R. NICHOLS, M. D., *Editor.*
WM. J. ROLFE, A. M., *Associate Editor.*

BOSTON JANUARY 1, 1883.

HIDDEN DANGERS.

NOTHING can be more startling than to discover that devices intended to protect the inmates of dwellings from dangers arising from furnace or sewer gases not only fail to protect, but the devices themselves enhance the dangers, in a large degree. A gentleman in this city, in order to cut off the inflow, and thus obviate all danger arising from sewer gas in his house, resorted to the well-known plan of turning the gases into a chimney, by attaching a pipe to the waste sewage pipe leading to the water-closet, and allowing it to open into the unused flue. In the employment of this device it was supposed that the gases, as they ascended from the sewer, would be drawn towards the chimney and escape into the outside air, instead of flowing through the trap of the closet into the dwelling. The theory is correct enough, but an unexpected danger arose, which ought to be widely known. Two severe cases of diphtheria occurred in the family, which led to a thorough examination of the waste pipes and sewage connections, and it was found that the damp, impure vapors from the sewers had followed up the water-closet waste-pipe, and flowing into the chimney had become condensed on the interior, thoroughly saturating the bricks, and passing through into the spaces connected with the rooms of the house. This inflow of the germ-impregnated vapors into the house through the chimney was the cause of the terrible disease which prostrated the children.

In this instance we have a practical warning, which ought to teach that any devices alleged to be protective should receive full and intelligent consideration before being adopted. If the attachment of pipes to the flue had been *above* the trap and bowl, the casualty could not have occurred; and probably if the attachment had been made to a chimney in active use, as that connected with the kitchen, the results would have been less disastrous.

We have much to learn in the matter of sanitary devices in our houses. No questions are more important than those which relate to protecting dwellings in cities from dangerous sewage and coal gases, and unless the perils are obviated the bills of mortality must continue to increase, until the deepest alarm will prevail.

BOGUS MEDICAL DIPLOMAS.

THAT numerous class of adventurers who live by deception and fraud have seldom devised a more cunning scheme than that of selling bogus medical diplomas to ignorant quacks who are willing to pay for them. Philadelphia had for several years the unenviable notoriety of harboring a nest of diploma manufacturers, who at one time were quite active in the business, but at last the traffic was suppressed. During the past two months it has become known that Boston had its bogus medical college, and that diplomas were sold to any worthless vagabond who could obtain money enough to buy one. Under the high-sounding name of "Bellevue College," a room or

two in an obscure part of the city was hired, and three men, consisting of a printer and a couple of quack doctors of the worst class, assumed the name and functions of a *medical faculty*.

Obtaining a legal status under the general corporation law, they were ready for business, which was to sell a roll of parchment with some Latin sentences, in the form of a college diploma, to any one who would buy. For twenty dollars or less, any ignorant or designing scamp could obtain a medical diploma, duly signed by the President and Faculty of "Bellevue Medical College of Boston."

One of the daily papers of the city deserves the credit of detecting and exposing this scandalous business, and it is hoped that it has, for the present at least, been suppressed. It is astonishing how many tramp doctors (?) there are in the United States who make a flourish with these bogus diplomas. Some of them are fairly executed, being written in Latin, and "well calculated to deceive." Others are but dirty bits of paper, having the stamp of quackery visibly upon them.

A doctor (?) who had obtained a fair standing in a country village in Massachusetts was requested, not long ago, to exhibit his diploma, and he forthwith brought to view one of the mean bits of parchment bought of the quacks who were running the "University Medical College of Pennsylvania," an institution which had no existence. It is important that the nature and extent of this business should be clearly understood, in order that the public may be protected from quackery in its most dangerous form.

THE LARGEST ELECTRO-MAGNET.

The largest electro-magnet in the world, according to the German *Humboldt*, is that in the physical institute of the Greifswald University. It is made of 28 plates of iron, each 7 millimeters (about ¼ inch) thick. A massive iron core was not permissible, owing to the cost and other difficulties. These plates were so cut that their width corresponded to the consecutive parallel chords of a circle seven times 28 mm. (20 inches) in diameter. They were heated in a fire, and bent to a horseshoe form. The sides that were to be opposite each other were varnished or lacquered, to make the action of the extra current as great as possible, and then they were fastened together. The projecting edges were then filed off smooth. In this way a horseshoe magnet was obtained that is 1270 mm. (51 inches) high. The diameter of the cylindrical core is about 8 inches, and its total length 9 feet. The distance of the poles from the centre of the cylinder is 24 inches, and the weight of the core 1381½ pounds. The magnetizing coil is partially of copper ribbon, and partially of copper wire. The strips of copper are in rings of 15 windings each, separated from each other by strips of gutta percha, and soldered together to form a continuous current. The copper wire is put around it up and down, two and two, with thick paper between the layers. There are five double layers of two wires each, so that with the copper ribbon there are 25 courses, one over the other, the weight of them being 605 pounds. Total weight of core and coil, 1986½ pounds.

For comparison we give the size of other large electro-magnets.

	Length of core.	Diameter of core.	Weight of core.	Distance of poles.	Number of layers of wires.	Total Weight.
	inches	inches	pounds	inches		pounds
Faraday's horseshoe magnet.	46½	40	142½	6.0	8	187
Pluecker's horseshoe magnet.	58	40½	185	11.4	8	262
Greifswald horseshoe magnet.	108	80	1381	24.0	25	1986

The iron core is cemented in a box made of stout oaken plank and resting on wheels. The current is generated by 54 Grove-Poggendorff cells.

With this powerful instrument a great variety of experiments can be performed. When a copper cylinder containing 40 grams of Wood's fusible metal (melting at 65° or 70° C.) is rotated between the poles it melts in less than two minutes. A rotating copper disk, 10 inches in diameter, which can be rotated rapidly in a vertical plane by means of a weight, is almost stopped on closing the current. The rotation of the plane of polarization in Faraday's flint glass is seen when the light passes through it only once. By using a sugar solution in a tube 8 inches long the plane of polarization changes from red to light blue on reversing the poles.

The magnetic action on liquids, gases, and flames can be made visible to a large audience.

THE HINDU PROCESS OF "LEOPING."

It will be remembered that in the Journal for last September (page 99) we printed a paragraph on this subject, which drew forth sundry inquiries for further information, as stated in the number for November (page 129). A lady subscriber in New Jersey now kindly sends us some extracts from "Sovinda Sàmanta," a prize story by Rev. Lal Behari Day, a Congregationalist clergyman of Calcutta, illustrating the social and domestic life of the rural population and working classes of Bengal. The extracts appeared in a recent number of *The Heathen Woman's Friend*, published in this city, and the following passage will show what the "leoping" really is:—

When the women got out of their beds, which they did always at crow-cawing, — I cannot say cock-crowing, for there was no cock, not only in the house, but hardly in the village, as cocks and hens are an abomination to Hindus, — they went to the side of the tank near the house, which served all necessary purposes. They then made a solution of cow-dung and water, and sprinkled the liquid by the hand on the open yard, which was next swept by a broom made of the stalks of palm-trees. But the rooms and the verandas require to be cleansed and washed in another fashion. As the flooring was entirely of earth, there being not a single brick or stone in the house, or a plank of wood either, every inch of the floor of every room was besmeared, by means of a piece of rag, with the said solution of cow-dung and water, and allowed to dry itself. The reader may think that this is a dirty business, and that the rooms must be the worse for being thus besmeared. But he is mistaken. He may take our word that the floor greatly improves by the process. It becomes smooth and glossy, and no cracks are visible. And as for any disgusting smell, there is nothing of the sort; the smell, if any, being positively pleasant. Hindu peasants besmear their cottages with a solution of cow-dung and water because cow-dung is regarded ceremonially as a purifier; it is, however, a question why Hindu law-givers should have pitched upon cow-dung as a purifier. Has it any sanitary value? Has it any disinfecting property? From the universal practice of the Hindus of Bengal, I should be inclined to think that cow-dung was a disinfectant; but I prefer to leave the matter in the hands of doctors and chemists.

Our New Jersey friend also sends us a note from Rev. J. C. Rankin, who was for many years a missionary in India, in reply to one of inquiry from her concerning his acquaintance with this curious Hindu custom. He says:—

The free use of the process of leoping was seen everywhere, inside and out of the houses, when I was in India. I do not think that the attention of missionaries or of the English residents had at that time been called to its *disinfecting* nature. Whether the Hindus themselves understood and practised it in that light is, I think, doubtful. It was regarded more as a customary process of cleanliness and preservation of the buildings than as a sanitary measure. The cow, being a sacred animal in their eyes, may have suggested the idea that benefit would arise from any proper use of anything pertaining to her; but I doubt whether many of the people have any intelligent idea or theory as to the matter of disinfection.

METEOROLOGY FOR NOVEMBER, 1882.

The sum of my observations on the weather for the past month has been as follows:—

Average Thermometer.		Lowest.	Highest.	Range
At 7 A. M.	31.33°	15°	59°	44°
At 2 P. M.	42.87°	30°	67°	37°
At 9 P. M.	34.07°	17°	54°	42°
Whole month	36.09°	15°	67°	52°
Second average[1]	35.58°			
Last 19 Novembers	36.33°	31.13° in 1873.	42.58° in 1877.	10.90°
Second average[1]	35.97°	30.62°	42.36°	11.74°
Autumn of 1882	51.29°	15°	84°	69°
Second average[1]	50.79°			
Last 19 autumns	48.63°	42.84° in 1864.	58.57° in 1881.	10.73°
Second average[1]	48.00°	42.09°	58.20°	11.11°
Daily extremes, 19 yrs.		—2°	90°	92°
Mean " "		11.26° in 1867.	83.53° in 1881.	72.27°

[1] Found by adding the average evenings *twice*.

The average barometer for the month was 30.017 inches; the lowest, 29.62, on the 13th, and the highest, 30.36, on the 4th, a range of .74 of an inch. The average for the last 10 Novembers has been 29.972; the lowest, 29.815, in 1873, and the highest, 30.193, in 1880, a range of .378 of an inch. The sum of the daily variations was 3.80 inches, an average daily movement of .127 of an inch. The average for the last 10 Novembers was .242, with extremes of .127 and .315, in 1882 and 1873. The largest daily movement the past month was .32 on the 12th, followed by slight rain.

The face of the sky in 90 observations gave 48 fair, 18 cloudy, 17 overcast, 1 rainy, and 6 snowy. The amount of rainfall, including 12 inches of melted snow, was only 1.10 of an inch. The average amount for the past 14 Novembers has been 3.52 inches; the lowest was 1.10, the past month, and the highest, 7.45, in 1877. The first snow of the season was on the 17th, 4 inches; on the 26th, 3 inches; and on the 29th, 5 inches: furnishing sleighing for Thanksgiving, — somewhat unusual.

The direction of the wind in the usual observations gave an excess of 26 northerly and 58 westerly

over the southerly and easterly, indicating the prevailing direction to be west 24° 10′ north, a full W. N. W. The average for the past 14 Novembers has been west 21° 35′ north. The westerly winds have uniformly prevailed over the easterly by an average of 46.07, with extremes of 7 and 66, while the northerly have prevailed over the southerly, with one exception in 1880, by an average of 18.21, with extremes of 1 and 44. In 1877 there was a low and near balance of 9 N. to 7 W.

The first half of the month, like the two months preceding, continued unusually mild, with no severe frosts, and an average of 42.78°, no extreme going below 26°, and only four evenings and four mornings as low as 32°. Nor did the barometer go below 30 inches till the 12th. But the last half of the month was more severe, with repeated snow-storms, and even sleighing on the 30th. Winter seemed to set in suddenly and in earnest. The average of this part of the month was 29.40°, with no observation below 15°, and the entire month slightly below the average for November. Yet the table above shows that the past three autumnal months give an average of 2.66° above that of the past 19 autumns.

On the morning of the 20th there was a remarkable aurora, covering a large part of the heavens with splendor and beauty, by which telegraphic lines were greatly disturbed for many hours, again illustrating the intimate connection between electricity and the aurora. D. W.

NATICK, *December* 8, 1882.

EDITORIAL NOTES.

ANTISEPTIC PROPERTIES OF CARBONIC ACID. — Some instructive results regarding the preservative action of carbonic acid on meat have been recently obtained by Professor Kolbe, of Leipsic. He hung pieces of beef, including fat and bone, in cylindrical tinned iron vessels, which were kept in a warm room of the laboratory, where the temperature at mid-day rose to 32° C. Each piece was hung from a cross-bar. A plate for dropping liquid stood below, and just over this was a tubular passage for the entrance of carbonic acid. The cylindrical lid of the vessel entered an annular trough holding glycerine, and had a tubulure in the middle. When nearly all the air was supposed to be driven out through the latter tubulure by the entering gas, the elastic tubes connected to both tubulures were pinched with screws. After eight days in the vessel the beef was not distinguishable from fresh beef in aspect or taste after cooking, and the gravy was like that from fresh beef. After a fortnight the beef had become somewhat gray externally, and only a fine palate would distinguish the gravy from that of fresh meat. Sometimes beef and gravy had a weakly acid taste, which was easily remedied with a little carbonate of potash. After three weeks the beef was still of the same good quality, only softer than fresh beef, and requiring less time to cook. It was quite free from bad smell, even after from four to five weeks, but the cooked gravy then no longer tasted so good as fresh gravy. It is noteworthy that mutton, under like treatment, began to smell badly after eight days; veal, too, could not be kept so long as beef. Fish, lobster, oysters, and fruit could be kept only a short time.

JEFFERSON'S SAW-MILL. — The following story is told of President Jefferson, and it has a good point in it: Jefferson was a great man, but he was far from practical in some things. When he was in France he was very much struck with the utility of windmills. He thought they were wonderful institutions, and cost so little to run. He owned a large quantity of timber on a mountain much higher than Monticello, about a mile off. He purchased in France a windmill and the machinery for a saw-mill at the cost of $13,000, and had it taken to the top of the mountain. He had for a neighbor a bluff old fellow named Cole. One day Cole came to see him, and Jefferson took him up to where he was having the mill built. It was as much as they could do to climb the steep ascent. When Cole recovered the breath he had lost getting up the mountain, he said, "Mr. Jefferson, you have a splendid saw-mill, and it is in a splendid place to catch the wind; but how are you going to get the logs up here to saw from?" The author of the Declaration of Independence started, like a man suddenly awakened from a delightful dream, and quickly said, "Hey, Cole, how? What?" And then, relapsing into abstraction, led the way down the mountain toward Monticello. The windmill was never completed, and years after the machinery was sold for old iron.

COMPOUND OXYGEN. — Professor Prescott, of the University of Michigan, has been analyzing several brands of this widely advertised substance. One bottle, labelled "Compound Oxygen — Keep Dark," was found to be a colorless aqueous solution of nitrate of ammonium and nitrate of lead, the two salts being in nearly equal proportions, and together forming about three per cent. of the solution. A companion bottle, labelled "Oxygen Aquæ for Digestion," was found to be water of a commendable degree of purity, quite free from sophistications. Probably this is the original compound oxygen. Another compound oxygen contained nitrate of ammonium alone. A fourth specimen, from Boston, was a colored, fragrant liquid, consisting of alcohol, chloroform, and balsam of tolu.

THE CROCODILE AND THE DYNAMOMETER. — A crocodile must certainly be an awkward customer for physiologists with a *penchant* for vivisection; but two Frenchmen, Drs. Regnard and Blanchard, have managed to strap one of these animals on a laboratory table, and measure the force with which it snaps its jaws, when stimulated with an electric current. The upper jaw was raised and attached at its extremity to a dynamometer. They calculate that a force of 150 kilograms is applied (in a crocodile about eight feet long) primarily on the space at the end of four large projecting teeth, and this corresponds to nearly 400 atmospheres.

ATOMS.

WAVE lengths of the sounds emitted by a man's voice in ordinary conversation are from 8 ft. to 12 ft., and of women's 2 ft. to 4 ft., per second.

THE remains of a forest at least three acres in extent have been found ten feet below the surface of the ground at Crowland, near Peterborough, England. Some of the trees are very large and in a good state of preservation, especially the firs.

AFTER a recent violent storm on the English coast, a quantity of saline matter was observed on windows at a distance inland. The deposit is believed to have been made by ocean spray, which in this case must have been blown by the wind at least sixty miles.

AN Italian journal recommends the use of methyl-aniline violet, also called Hofmann's purple and Paris violet, for detecting free mineral acids in vinegar. A solution of this dye, although containing but 0.1 per cent. of it, will be changed to an ultramarine blue by mineral acids, even when they are very dilute, while organic acids do not affect the color.

ORDINARY American railway cars weigh as follows: a sleeping-car of the usual pattern, about 66,990 pounds; a drawing-room car, 63,900 pounds; a passenger car, 55 feet long, 42-inch wheels, and four-wheel trucks, weighs 45,310 pounds.

GLASS-SPINNING and glass-flower manufacture are a very extensive branch of the Austrian glass industry. It is now so developed that a petroleum flame gives some more than fifteen hundred yards of glass thread every minute, that are woven not only for glass cloths, etc., but also for watch-chains, brushes, etc.

A PHYSICIAN falls into a fit while making a round of visits, and is carried into a drug store. "Send for Dr. X——," says somebody. "No, no, not for him," says the dying man feebly, at the mention of his rival's name. "If he brought me around it would advertise him! I prefer to die."

THE verdict of the coroner's jury at Tunbridge Wells, on the death of a child, was: "The child was suffocated, but there is no evidence to show that the suffocation was before or after death."

LITERARY NOTES.

The Life and Works of Darwin is a valuable little book, containing a biography of the great naturalist and essays upon his work in the various departments of natural science, by his personal friends and fellow-laborers. It is illustrated with an excellent steel engraving of Mr. Darwin, and altogether it is a most valuable souvenir of one of the greatest scientists that ever lived. Price 75 cents. For sale by Lockwood, Brooks & Co.

The sixth decennial revision of the *United States Pharmacopœia* is now completed, and the work is published by William Wood & Co, of New York. Many important changes have been made in this edition; crude drugs are more thoroughly described than heretofore, and the more common adulterations are pointed out, and directions given for their detection. All chemicals have their symbols given, according to both the old and new notation, and the principal determinative tests are explained. The names of alkaloids are made to terminate uniformly in *ine* instead of *ia*. The greatest change, however, will be found in the substitution of parts by *weight* instead of parts by *measure*, as heretofore. The fluid extracts form the only exception to this rule. Both the French and English weights and measures are used. As this will be the standard and official work for the next ten years, it is almost indispensable to druggists, who can obtain it from the publishers, or from Hall & Whiting, Boston. Price, $4.00.

The *Physician's Visiting List*, published by the same house, will be found a very convenient volume. It is arranged for thirty calls a day and contains all the usual obstetrical tables, vaccination list, cash account, etc., that any physician may require.

Every one is more or less subject at times to trifling indispositions, which, while they do not seem to justify the attendance of a physician, yet are productive of as much discomfort as many serious diseases. The work by Dr. Beale on *Slight Ailments* is adapted to meet just this kind of cases, and, while written in a very popular style, readily understood by any one, is yet perfectly adapted to the needs of physicians who may be called upon to treat this class of cases. Among the subjects included are sore throat, indigestion, sleeplessness, nervousness, etc., with full and clear directions for treatment. Published by P. Blakiston, Son & Co. For sale by A. Williams & Co., Boston. Price, cloth, $1.25; paper, 75 cents.

Cheap reprints of the best foreign fiction have been published for a long time, and we are glad to see that scientific works are now issued in the same manner. Nos 37 and 38 of the "Humboldt Library" have been received by us from Messrs. A. Williams & Co., and consist of Professor Tyndall's *Lectures on Light* and *Geological Sketches* by Professor Geikie. Both these writers stand at the head of their profession, and at the low price of 15 cents their works should meet with a large sale.

We have also received *The Medical Register of the City of Philadelphia, Dodd's Advertiser's Manual and Newspaper List, The Chemists' and Druggists' Diary for* 1883, published by the proprietors of *The Chemist and Druggist*, London, and *The American Newspaper Catalogue*, published by Edwin Alden & Bro., of Cincinnati.

The Fifteenth Edition of the *United States Dispensatory* will be published by Lippincott & Co., of Philadelphia, this month. The editors are Dr. H. C. Wood, Professor of Materia Medica and Therapeutics in the University of Pennsylvania, Joseph P. Remington, Professor of Pharmacy, and Samuel P. Sadtler, Professor of Chemistry, in the College of Pharmacy of Philadelphia. The revision has occupied about three years, and has been in all respects most thorough and complete, embracing the most recent discoveries in materia medica, pharmacy, chemistry, and therapeutics.

In reply to inquiries from correspondents we would state that thirty-five volumes of Mr. Rolfe's edition of Shakespeare — which Mrs. Cowden-Clarke proposes to call "The Friendly Edition" — have now been published; and *Pericles* and *The Two Noble Kinsmen*, completing the list of *plays*, are now printing. The volume of *Poems* is also in press, and the one devoted to the *Sonnets* will soon go to the printer. A volume containing the *Life* of the dramatist, with miscellaneous matter relating to his works, etc., will finish up the forty volumes of the series. Revised editions of the first four plays will be issued with line-numbers in text and notes, making these volumes uniform with the rest. The complete edition will probably be ready in various styles of binding within three or four months.

Medicine and Pharmacy.

DR. O. W. HOLMES'S FAREWELL ADDRESS AT THE MEDICAL SCHOOL.

Dr. Holmes is always witty and wise, but on special occasions he surpasses himself. As might have been expected, his farewell address to the Harvard Medical School, on the 28th of November, was a fitting close to a memorable service of thirty-six years as professor in that institution. It is printed in full in the *Boston Medical and Surgical Journal* of December 7th, but many of our readers who do not see that excellent weekly will thank us for giving some extracts from the address here.

Referring to the progress in science during his professional career, the Doctor said: —

Since I began teaching in this school, the aspect of many branches of science has undergone a very remarkable transformation. Chemistry and physiology are no longer what they were, as taught by the instructors of that time. We are looking forward to the synthesis of new organic compounds; our artificial madder is already in the market, and the indigo raisers are now fearing that their crop will be supplanted by the manufactured article. In the living body we talk of fuel supplied and work done, in movement, in heat, just as if we were dealing with a machine of our own contrivance. A physiological laboratory of to-day is equipped with instruments of research of such ingenious contrivance, such elaborate construction, that one might suppose himself in a workshop where some exquisite fabric was to be wrought, such as queens love to wear, and kings do not always love to pay for. They are, indeed, weaving a charmed web; for these are the looms from which comes the knowledge that clothes the nakedness of the intellect. Here are the mills that grind food for its hunger, and "is not the life more than meat, and the body than raiment?"

But while many of the sciences have so changed that the teachers of the past would hardly know them, it has not been so with the branch I teach, or, rather, with that division of it which is chiefly taught in this amphitheatre. *General* anatomy, or histology, on the other hand, is almost all new; it has grown up, mainly, since I began my medical studies. I never saw a compound microscope during my years of study in Paris. Individuals had begun to use the instrument, but I never heard it alluded to by either professors or students. In *descriptive* anatomy I have found little to unlearn, and not a great deal that was both new and important to learn. Trifling additions are made from year to year, not to be despised and not to be overvalued. Some of the older anatomical works are still admirable, some of the newer ones very much the contrary. I have had recent anatomical plates brought me for inspection, and I have actually buttonholed the book agent — a being commonly as hard to get rid of as the tar baby in the negro legend — that I might put him to shame with the imperial illustrations of the bones and muscles in the great folio of Albinus, published in 1747, and the unapproached figures of the lymphatic system of Mascagni, now within a very few years of a century old, and still copied, or, rather, pretended to be copied, in the most recent works on · · tomy.

After giving some account of his early experiences as a medical student in this country, and paying a warm tribute to Dr. Winslow Lewis, who was one of his teachers, Dr. Holmes took his hearers with him to Paris, and photographed for them some of the famous French professors of that day. We must pass by the graphic word-pictures of Dupuytren, Velpeau, Broussais, Andral, and others, and give only that of Louis, with the reflections that follow: —

Pierre Charles Alexandre Louis, at the age of forty-seven, as I recall him, was a tall, rather spare, dignified personage, of serene and grave aspect, but with a pleasant smile and kindly voice for the student with whom he came into personal relations. If I summed up the lessons of Louis in two expressions, they would be these; I do not hold him answerable for the words, but I will condense them after my own fashion in French, and then give them to you, expanded somewhat, in English: —

Formez toujours *des idées nettes.*
Fuyez toujours *les à peu près.*

Always make sure that you form a distinct and clear idea of the matter you are considering.

Always avoid vague approximations where exact estimates are possible; *about so many*, — *about so much*, instead of the precise number and quantity.

Now, if there is anything on which the biological sciences have prided themselves in these latter years it is the substitution of quantitative for qualitative formulæ. The "numerical system," of which Louis was the great advocate, if not the absolute originator, was an attempt to substitute series of carefully recorded facts, rigidly counted and closely compared, for those never-ending records of vague, unverifiable conclusions with which the classics of the healing art were overloaded. The history of practical medicine had been like the story of the Danaides. "Experience" had been, from time immemorial, pouring its flowing treasures into buckets full of holes. At the existing rate of supply and leakage they would never be filled; nothing would ever be settled in medicine. But cases thoroughly recorded and mathematically analyzed would always be available for future use, and when accumulated in sufficient number would lead to results which would be trustworthy, and belong to science.

You young men who are following the hospitals hardly know how much you are indebted to Louis. I say nothing of his Researches on Phthisis or his great work on Typhoid Fever. But I consider his modest and brief Essay on Bleeding in some Inflammatory Diseases, based on cases carefully observed and numerically analyzed, one of the most important written contributions to practical medicine, to the treatment of internal disease, of this century, if not since the days of Sydenham. The lancet was the magician's wand of the dark ages of medicine. The old physicians not only believed in its general efficacy as a wonder-worker in disease, but they believed that each malady could be successfully attacked from some special part of the body, — the strategic point which commanded the seat of the morbid affection. On a figure given in the curious old work of John de Ketam, no less than *thirty-eight* separate places are marked as the proper ones to bleed in, in different diseases. . . .

But what Louis did was this: he showed by a strict analysis of numerous cases that bleeding did not strangle — *jugulate* was the word then used — acute diseases, more especially pneumonia. This was not a reform, — it was a revolution. It was followed up in this country by the remarkable Discourse of Dr. Jacob Bigelow upon Self-Limited Diseases, which has, I believe, done more than any other work or essay in our own language to rescue the practice of medicine from the slavery to the drugging system which was a part of the inheritance of the profession. . . .

There is one part of their business that certain medical practitioners are too apt to forget: namely, that what they should most of all try to do is to ward off disease, to alleviate suffering, to preserve life, or at least to prolong it if possible. It is not of the slightest interest to the patient to know whether three or three and a quarter cubic inches of his lung are hepatized. His mind is not occupied with thinking of the curious problems which are to be solved by his own autopsy, — whether this or that strand of the spinal marrow is the seat of this or that form of degeneration. He wants something to relieve his pain, to mitigate the anguish of dyspnœa, to bring back motion and sensibility to the dead limb, to still the tortures of neuralgia. What is it to him that you can localize and name by some uncouth term the disease which you could not prevent and which you cannot cure? An old woman who knows how to make a poultice and how to put it on, and does it *tuto, cito, jucunde*, just when and where it is wanted, is better — a thousand times better in many cases — than a staring pathologist, who explores and thumps and doubts and guesses, and tells his patient he will be better to-morrow, and so goes home to tumble his books over and make out a diagnosis.

But in those days I, like most of my fellow students, was thinking much more of "science" than of practical medicine, and I believe if we had not clung so closely to the skirts of Louis, and had followed some of the courses of men like Trousseau, — therapeutists, who gave special attention to curative methods, and not chiefly to diagnosis, — it would have been better for me and others. One thing, at any rate, we did learn in the wards of Louis. We learned that a very large proportion of diseases got well of themselves, without any special medication, — the great fact formulated, enforced, and popularized by Dr. Jacob Bigelow in the Discourse referred to. We *un*learned the habit of drugging for its own sake. This detestable practice, which I was almost proscribed for condemning somewhat too epigrammatically a little more than twenty years ago, came to us, I suspect, in a considerable measure from the English "general practitioners," a sort of prescribing apothecaries. You remember how, when the city was besieged, each artisan who was called upon in council to suggest the best means of defence, recommended the articles he dealt in: the carpenter, wood; the blacksmith, iron; the mason, brick; until it came to be a puzzle to know which to adopt.

"*Then the shoemaker said, Hang your walls with new boots,*"

and gave good reasons why these should be the best of all possible defences. Now the "general practitioner" charged, as I understand, for his medicine, and in that way got paid for his visit. Wherever this is the practice, medicine is sure to become a trade, and the people learn to expect drugging, and to consider it necessary, because drugs are so universally given to the patients of the man who gets his living by them.

We would fain continue to cull from this eloquent address, but our limits forbid us and our readers the pleasure. No doubt some of them will be tempted by the taste we have given of it to send to the publishers of the *Medical and Surgical Journal* for the number containing the whole of it.

DIET FOR NIGHT-WORKERS.

Turning night into day, as certain classes of workers have to do, is a severe draught upon the system, and in order to bear the strain careful attention to dietetic and other habits is necessary. With regard to food the following suggestions, by Miss Juliet Corson, are excellent: —

For night-workers the best plan includes a hearty breakfast when they rise, which is generally from twelve to three o'clock; some out-door exercise and relaxation should precede a good dinner, partaken between six and nine o'clock at night, before beginning work. If the work is to continue until four or five o'clock in the morning, a light but nutritious repast should be eaten shortly after midnight, in

order to fortify the system for labor during the hours immediately following, when the vital powers are most enfeebled. When the work is done, and before retiring, a very simple lunch should be taken in the form of good hot broth or beef tea, or a glass of light wine and a couple of crackers. This will generally insure sleep by withdrawing the blood from the brain, where it has been concentrated by mental effort. In ordinary cases of sleeplessness, not confirmed by long-continued habit, a light meal of this kind will generally prove a remedy. The substitution of phosphatic or so-called brain and nerve foods for a well-chosen regular diet is much to be reprobated; however excellent these preparations may be as adjuncts, a man might as well expect to work indefinitely upon the stimulation of alcohol as to live upon them without the necessary supplement of ordinary nutritious diet. By attention to these details, and by securing sufficient sleep, night-workers can preserve their health under ordinary circumstances.

NEW MODE OF VACCINATION.

Dr. Charles F. Moore, in a short paper read before the British Medical Association, describes the following method: —

With a perfectly clean sharp lancet, I make five or six single scarifications, holding the lancet as a pen is held, resting securely but gently on the arm of the person operated on, which I hold with the left hand. The operation, thus performed, scarcely occupies two seconds, and when done lightly, but sufficiently, does not waken a sleeping infant, nor cause a waking child to cry, provided the attention be diverted by gently stroking the arm, or otherwise engaging the attention. The lymph from the arm of another child, or preserved in tubes or on points, is then to be gently rubbed with the flat of the lancet or charged points across the little wounds, which may be made to gape by slight traction on the adjacent skin. It is neither necessary nor desirable to make the incisions at all deep; and, if the appearance of a little blood do not speedily occur, getting the parent to gently "hoist" the child, which does not waken a sleeping infant, will generally give the circulation sufficient impetus to cause a slight but sufficient evidence that the cutis was reached by the incisions.

The result of this mode of operating I have found to be one or more, usually two, separate vesicles, or an oblong compound one at the site of each pair of scratches, and one at the site of the single scratch, or more if six were made in all, or if they were made longer than usual.

PEAT MOULD FOR DRESSING WOUNDS.

A correspondent of a London journal writes as follows: —

Two years ago, a laborer, one day, appeared who had sustained a compound fracture of both bones of the fore-arm eight or ten days previously, with considerable laceration. He had got a comrade to surround the whole fore-arm at once with a thick paste of peat mould, on which was laid a rough splint of wood. He was in good general health, and on clearing off the mould the wound was found to be healing beautifully, without any sign of suppuration. A Listerian dressing was applied, and the limb better fixed, and the man made a good recovery. Dr. Neuberg, of Kiel, was led to investigate the properties of peat mould, with reference to wound-dressing, and he found that the dust resulting from the manufacture of blocks of peat with the circular saw (as carried on in Schleswig-Holstein), and which is very light in weight and color, has a powerful affinity for ammonia, carbonate of ammonia, and bad-smelling materials generally, and takes up nine times its own weight of water. In the infantry barracks at Brunswick it is found very useful as a deodorizer in privies. For dressing wounds Dr. Neuberg now uses two bags of gauze (one double the other in size) wrung out in carbolic solution, and filled with mould; the mould in the smaller bag containing 2½ per cent. of iodoform, that in the larger saturated with 5 per cent. carbolic solution. The smaller bag is placed on the wound directly after disinfection of the latter with carbolic solution, zinc chloride, or iodoform, and the larger bag is placed above, the whole being kept in place by a gauze bandage. The dressing remains on mostly a fortnight or more. Excellent results have been thus obtained, into details of which we do not here enter. The advantages claimed for the method are these: (1.) A given quantity of the mould takes up more fluid than jute, gauze, or cotton wool. If it be slightly moistened, its absorbent power is increased. (2.) It has great power of absorbing products of decomposition of organic substances, and hence prevents these occurring. (3.) The moistened mould is a very soft but still elastic substance, and so is easily placed in the required position in the bags before applying them to the inequalities of the body. (4.) It is the cheapest of known antiseptic dressings, one pennyworth being sufficient for one dressing, and still less if the preparation with an antiseptic be left out. (5.) It makes a very suitable pad for all purposes when enclosed in gauze.

THE CARE OF THE HAIR.

The following directions for promoting the growth of the hair and keeping it in good condition are well worth making a note of: —

(1.) Keep the scalp scrupulously clean, and particularly free from "dandruff."

(2.) Brush the scalp daily with a moderately stiff brush without using too much friction.

(3.) Wash the head occasionally with soap and water, to remove fatty substances which have become acid and rancid.

(4.) Keep the head cool, and do not unnecessarily keep it covered, particularly in warm rooms, indoors.

(5.) Keep the skin of the scalp soft, pliable, and faintly moist — if not naturally so — by the judicious application of some bland substance, like vaseline, castor oil, almond oil, etc. (all of which may be suitably perfumed). Some of the following may also be recommended: —

(1.) Castor Oil	8 ounces.
Alcohol	8 "
Oil bergamot	q. s.
(2.) Glycerine	8 ounces.
Alcohol	8 "
Oil lavender	2 drachms.
Oil rosemary	1 drachm.
Sulphate of quinine	60 grains.

Dissolve the sulphate of quinine in the alcohol, add the oils and finally the glycerine.

To stimulate the scalp, a small quantity of tincture of cantharides, about two drachms for the above formula, may be added.

When the hair-follicles (or rather the papilla at the bottom of each follicle) have been destroyed by disease or otherwise, it is impossible to make the hair grow.

SALICYLIC ACID FOR CORNS.

A correspondent of the *Chicago Medical Times*, referring to Gezou's remedy for corns, the formula for which is given below, says: —

In the "Transactions of the Medical Society of Pennsylvania" for the year 1876, I reported the use of salicylic acid in the treatment of corns. I used it first in the treatment of soft corns, but very soon found it would remove hard ones as well. I applied it on cotton, and I can testify to the certainty of the effects of salicylic acid in the treatment of these painful excrescences on the toes.

It occurred to me, when I read Mr. Gezou's prescription, that the collodion which he employed to dissolve the acid would keep it well applied to the corn, and I have used it as prepared by him in a great many cases, and with constant success.

The collodion fixes the acid on the diseased part, and gives speedy relief by protecting it from friction. The cannabis indica acts as an anodyne, and the acid reduces and loosens the corn, so that it comes off in four or five days, adhering to the collodion. The remedy is applied with a camel's-hair pencil, and if the corn is not well cured the application may be repeated. In four or five days the patient should use a warm foot-bath and rub off the collodion. If any portion of the corn remains, the acid should be applied again, and the treatment continued until the whole of the corn has disappeared. The skin will be soft and smooth, as in the healthy state.

The mixture dries immediately, and does not prevent for a moment the use of the stocking.

I have used salicylic acid in the treatment of bunions with like good results. Collodion as found in the shops makes a good mixture, but I have found Dr. Edward R. Squibb's flexible collodion preferable, as it makes, with the other ingredients of the remedy, a denser fluid. The extract of cannabis should be the solid extract.

Mr. Gezou's formula is: —

℞ Salicylic acid	30 parts, or grs. xxx.
Ext. cannabis indica	5 parts, or grs. v.
Collodion	240 parts, or f. ℥ ss.

DOMESTICITY AS A CAUSE OF INSANITY.

There is a "moral" worth pondering in the following brief extract from the *Report of the Hartford Retreat for the Insane*: —

Mrs. M——, aged forty-four, mother of eight children, acute mania. The husband, when asked if he could suggest any cause for her illness, exclaimed, with much animation, that he could not conceive any reason. "She is a most domestic woman; is always doing something for her children; is *always* at work for us all; *never* goes out of the house, even to church on Sunday; never goes gadding about at the neighbors' houses, or talking from one to another; has been one of the best of wives and mothers, and was *always* at home." The superintendent, in commenting on this case, says, "This appreciative husband could hardly have furnished a more graphic delineation of the causes of his wife's insanity, had he understood them never so thoroughly."

MRS. LANGTRY INTERVIEWED AGAIN.

The *New York Medical Record* gives the following veracious account of an interview with the famous English beauty: —

She said that she was not a homœopathist, as had been stated; she believed in the New York code, however. Her impressions of American medical men had so far been very favorable, and confirmed previous anticipations formed by a constant reading of *The Medical Record*. The branch of medicine in which she had been chiefly interested was dermatology; in this America easily led the world, and she was sorry she could not have got over in time for the Newport meeting of the Association. She attributed the beauty of her complexion to a constant study of American dermatological literature.

Mrs. Langtry was hardly prepared to give her opinion of post-graduate schools, but thought they were very nice. She would send tickets, she said, to any doctors not connected with some medical school, — it seemed such a pity. The reporter told her, however, that there were none such. Mrs.

Langtry preferred to take her medicines in pill form. She liked the oval-shaped, sugar-coated ones best.

Mrs. Langtry asked about our insane asylums, and strongly urged the use of the tight-fitting jacket known as the "Jersey," as a substitute for camisoles and strait-jackets.

COUGH MEDICINES.

We present a few simple recipes (from the *Druggists' Circular*) for expectorants, useful for winter coughs. The first is particularly suitable for young children:—

Syrup of squill	1 fl. drachm.
Gum acacia, powdered	½ fl. drachm.
Ammonium chloride	8 grains.
Peppermint water, enough to make two fluid ounces.	

Dose for a child, a teaspoonful every two hours.

Another formula, for older children and adults, consists of

Syrup of ipecac	2 parts.
Syrup of squill	4 parts.
Paregoric	1 part.

Dose, half to one teaspoonful, repeated as often as necessary.

The following was a favorite prescription of the late Prof. C. A. Lee, of Peekskill:—

Syrup of ipecac	1 ounce.
Syrup of tolu	1 ounce.
Paregoric	½ ounce.
Syrup wild cherry	1 ounce.

For Hoarseness. — Dr. Eichelberger gives the following, which he says is very good for hoarseness:—

Tinct chloride of iron	2 drachms.
Glycerine	4 drachms.
Water	4 drachms.

Dose, half a teaspoonful *pro re nata*.

MISCELLANEA.

Burnt Alum in Ague. — Baboo Brojendra Nath Banerjee states that this is a very cheap, easily procurable, and efficient anti-periodic medicine. The value of alum is chiefly marked in cases of fever in which the attacks come on with clockwork regularity. It usually fails in irregular types of intermittent fever. Two doses are generally sufficient to complete the cure. Eight grains of burnt alum are to be given in each dose. The first dose is to be given three hours, and the next an hour, before the expected attack of fever.

An exchange, after quoting the above from *The Practitioner*, adds: Alum may prove an efficient drug for killing the bacilli of malaria, but there seems to exist an inherent potency in Dr. Baboo's full name that will more effectually intimidate rampant malarial germs than any drug yet invented by medical sagacity all the world over.

Philadelphia Hospitals. — The *Chicago Medical Review* says: "According to a local paper, a man who had been carried to a Philadelphia hospital while suffering from the effects of a severe contusion, was asked if he had been treated kindly while there. 'Considering all things,' he answered, 'I have no right to complain. They amputated both my feet, removed my clavicle, cut off my right arm, trephined me, took out a piece of my inferior maxillary, sawed my left os innominatum in two, and were about to exsect five or six ribs, when a fire broke out in the establishment, and the police got away with the rest of my body in safety.'"

The *New York Medical Record* remarks: "This simple, straightforward, and temperate statement of facts carries conviction with it; but had it been made by any other than a Chicago man, we could scarcely have credited it. We have also learned that George Washington's hatchet and original cherry-tree are now in the possession of the victim, and will be sold cheap, for cash, for the benefit of his widow, should he die from the original contusion."

The Ether Spray an Immediate Cure for Neuralgia. — Dr. McColganan extols the value of the ether or rhigolene spray for the instantaneous relief principally of facial neuralgia. He first had occasion to observe its good effects upon his own person, he having suffered greatly from facial neuralgia. Since curing himself, he has had occasion to test its efficacy in about twenty cases. The result was invariably a most gratifying success. In many instances a permanent cure was established. He attempts to explain its action by supposing a complete change to take place in the nutrition of the affected nerve, in consequence of the intense cold acting as a revulsive.

Improvement in the Paris Morgue. — The bodies in the Paris morgue are now frozen, and kept in this condition until their final disposition. The freezing apparatus consists of a modification of the Carré method, in which the cold is produced by the evaporation of previously liquefied gaseous ammonia. But instead of water, a solution of calcium chloride, which remains liquid at a temperature of 20° F., is made the direct recipient of the cold thus generated, and is carried in pipes to the top of the building, whence it falls in cascades. The same fluid is again collected and re-exposed to the freezing machine. In this way the temperature of the room is kept well below the freezing-point constantly. When bodies have become putrid, or require to be kept longer than usual, they are placed in a row of cases like a set of pigeon-holes, where, by means of the same apparatus, the temperature is maintained at a much lower point. The bodies which have been kept at 20° F., and which have been for weeks of stony hardness, show very little tendency to putrefaction.

Fasting in Acute Rheumatism. — Dr. Wood, professor of chemistry in the Medical Department of Bishop's College, Montreal, reports, in the *Canada Medical Record*, a number of cases in which acute articular rheumatism was cured by fasting, usually from four to eight days. In no case was it necessary to fast more than ten days. Less positive results were obtained in cases of chronic rheumatism. The patients were allowed to drink freely of cold water or lemonade in moderate quantities, if they preferred. No medicines were given. Dr. Wood says that from the quick and almost invariably good results obtained by simple abstinence from food in more than forty cases in his own practice, he is inclined to believe that rheumatism is, after all, only a phase of indigestion, to be cured by giving complete and continued rest to all the viscera.

Luxation of the Jaw. — The late Professor Gibson used to tell a good anecdote in regard to luxation of the jaw: "An old and quite wealthy man came into the office of a surgeon, with a luxation of the jaw, and made motions to have it reduced. The jaw was reduced, and on being asked the fee the doctor mentioned an amount which the man regarded as entirely too much, and insisted on its being reduced one half. The surgeon said no more about the fee, but began to talk, and pretty soon told a laughable story. The man began to laugh heartily, and out went the jaw. He again made signs to have it reduced, but the doctor said, 'When you pay down my fee, I will put in your jaw.'"

Asthma Cigarettes. — Impregnate well-nitred tobacco with an alcoholic fluid extract of grindelia; let dry, and use in cigarettes. Owing to the nitre, they will continue to glow and develop smoke.

The Third Corpuscle of the Blood. — Mrs. Ernest Hart, in the *London Medical Record*, publishes a criticism upon Dr. Norris's work on the physiology of the blood. She claims that the "invisible corpuscle" described by him is really only a red corpuscle decolorized.

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I have used S. H. Kennedy's Concentrated Extract Pinus Canadensis in some affections of the rectum, vagina, and cervix uteri. I have used it considerably diluted, as a vaginal wash, with great success; but I prefer to apply it to the os tincæ on cotton-wool, either pure or mixed with glycerine, or glycerine and rose-water. Thus applied it should remain intact for two or three, or even four, days, and then be renewed In this way I have seen chronic granular vaginitis remedied in a few days that had resisted the ordinary remedies for weeks; and have seen granular erosions, with leucorrhœa, disappear very rapidly under its use. I have not time to do more than call the attention of my professional brethren to this new extract, which I am sure will soon be recognized as a valuable addition to our Materia Medica.

J. Marion Sims, M. D.
267 Madison Avenue, New York.

Anglo-Swiss Milk Food. — The attention of the medical profession has of late been closely directed to the cause of the enormous proportion of infantile deaths, as recorded in the mortuary records. The general conclusion seems to be that this terrible loss of life in young children, especially at the critical period during the earlier months of dentition (at which time some artificial food is generally either added to, or entirely substituted for the, natural aliment), is largely due to innutrition; in other words, that, owing to the want of an artificial food calculated to supply the great demands upon the system, the infant is, in effect, starved.

Although, perhaps, diluted cow's milk offers the best substitute for that designed by Nature, yet in so few cases can this be found pure, at least in cities, that it does not contain the essential ingredients for the support and development of infantile life, and some other nourishment is indicated.

To meet this want several artificial milk foods, more or less scientifically prepared, have been introduced to the public, one of the most desirable being that known as the Anglo-Swiss Milk Food (made by the Anglo-Swiss Condensed Milk Company at Cham, Switzerland). This food has been proved to contain all the necessary ingredients for a reliable food for infants, and having received the highest indorsements from the medical profession in Europe, and in New York and other American cities, may therefore be used with perfect confidence by all having the care of young children.

St. Louis, Mo.

I frequently prescribe Celerina when I want to use a reliable compound of celery and coca, and the prescription has given me satisfaction in its results as a nerve-tonic in many cases

Yours very truly, C. H. Hughes, M. D.,
Lecturerer on Psychiatry and Neurology, Post-Graduate Faculty, St. Louis Medical College, Editor *Alienist and Neurologist, etc.*

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Horsford's Acid Phosphate has been found to neutralize the immediate ill effects of the use of tobacco, such as wakefulness, disturbed sleep, low spirits, depressed feeling of the brain, unpleasant sensation in the stomach, etc. Excellent in all nervous diseases.

Boston Journal of Chemistry
AND
POPULAR SCIENCE REVIEW.

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Familiar Science.

THE CLAY-METAL.

IT is a curious fact that the most abundant metal in nature, and one whose properties fit it for extensive and varied uses, is a comparative rarity in commerce, and so little employed in the arts that the entire annual product is estimated to be about a single ton. Of all the chemical elements, whether metals or non-metals, the most widely distributed, with the exception of oxygen and silicon, is *aluminium;* and yet it is practically inaccessible to the chemist and the artisan. Every clay-bed is a rich mine of it, but no method of obtaining it in metallic form has yet been devised which is not too expensive to be carried out profitably on the large scale. Every year or two we see sensational paragraphs in the newspapers, stating that a new and economical process for obtaining the metal has been discovered, but nothing seems to come of it. Recently it has been announced that a Mr. James Webster, of Birmingham, England, after experimenting in secret for some thirty years, has now begun the manufacture of aluminium by a new patent process, which is considered so valuable that a French syndicate has offered more than a million of dollars for the privilege of controlling it in France alone. According to the published accounts, all that Mr. Webster appears to have done is to devise a new method for preparing *alumina*, which is only a preliminary step in the production of *aluminium*, of which alumina is an oxide. He grinds together alum and pitch, and calcines the mixture, obtaining sulphur, potash, and alumina, with oxide of iron, in a dry state. The sulphur is then driven off by heat, and the potash dissolved out with warm water. The purified alumina must then be treated for the extraction of the metal in the same manner as heretofore. The method usually pursued has been to prepare a trisodic aluminate ($3Na_2OAl_2O_3$) from bauxite, and precipitate the alumina as hydrate by means of carbonic or hydrochloric acid. The aluminic hydrate is mixed with salt and charcoal, and made into balls, which are dried, and then heated to redness in earthen retorts. On passing dry chlorine into the mixture a sodic-aluminic chloride ($2NaClCa_2Cl_6$) is obtained by distillation, and from this the aluminium has to be separated in a reverbatory furnace by the employment of metallic sodium. The fused metal collects on the hearth of the furnace, and is then cast into ingots.

Aluminium was first isolated by Wöhler in 1827, but it was not until 1854 that Bunsen prepared it from the chloride by electrolysis, and in the same year Deville began to experiment upon its production on the large scale. At the Paris Exhibition of 1855 the "silver made from clay" attracted much attention, and its speedy introduction into the arts was predicted; but although the manufacture of sodium, which is a necessary element in the separation of aluminium, has been much improved and cheapened, it has not been found possible to put the clay-metal in the market at a price low enough to cause any large demand for it. Whether Mr. Webster's new process (which may include more than the newspaper reports have stated) will materially reduce the cost remains to be seen. If it does, it will prove of immense value, and the French syndicate will have made a good investment.

It is probable that the great majority of our readers have never seen this metal, though small articles made of it are to be found in jewellers' shops in most of the large cities. It is nearly as white as silver, and susceptible of a high polish, but articles made of it are usually finished with a "dead" surface. It is malleable and ductile to a high degree. It does not oxidize, or "rust," at ordinary temperatures, and is not readily acted upon by sulphur or most of the acids. The best solvent for it is hydrochloric (muriatic) acid. Its most remarkable property, however, is its extreme lightness. Its specific gravity is only about 2.5, or about one fourth that of silver. The only metals of less density are magnesium (specific gravity, 1.743) and sodium (which is a trifle lighter than water), with a few others, like potassium, lithium, rubidium, etc., which are little else than curiosities of the laboratory. It is emphatically *the* "light weight" among the metals which are, or promise to be, of industrial and commercial importance; and this fact, together with its beauty, lustre, unalterability in the air, non-poisonous nature, and ease of working, will ensure it a high place among the useful metals as soon as it becomes reasonably cheap. It is clearly marked by nature for extended applications in the arts; and the problem for chemists and metallurgists is to find some ready and economical means of releasing it from its base imprisonment in common clay, and make it, as it was meant to be, a thing of beauty and utility in our every-day life. No doubt the time will come when people will wonder how the world got along without a metal which to them will be as familiar as silver or tin is to us. It is only a few years since nickel, though long known and used to some extent in alloys, attained any great industrial value; and aluminium and its alloys (of which we will say nothing in detail now) are likely to become of tenfold more service to man than nickel is at present, or will probably be in the future. Who will find the golden key to unlock the treasure-house of the clay-bed, and give this new metallic boon to the human race?

EVOLUTION: ITS PRINCIPLES AND PROOFS.

THIS was the theme of one of Dr. Winchell's popular lectures at Martha's Vineyard, last summer. In the course as there given it preceded the lecture of which an abstract appeared in the last number of the JOURNAL. The following epitome, though necessarily concise, will serve to give our readers a general idea of it, and its accuracy is endorsed by the lecturer: —

The lecture itself was only an abstract of the argument in proof of a method of evolution in the world, and an abstract of this abstract must be almost too concentrated for usefulness. The speaker first defined evolution in technical phrase as "the progressive differentiation of an identical existence." This abstract formula was illustrated by reference to the transformations of the substance within the egg. Evolution, he said, is therefore only a mode of succession in a series of terms. Each term *grows* out of the preceding one, instead of being *independently originated.* The question of evolution in the world is a question of *fact*, not one of *causation.* It is to be settled by observation, not by opinion, or prejudice, or authority; and after the fact is established we may inquire about the conditions under which successions of this kind are effected, and the causes or cause whose efficiency produces them under the conditions.

Are forms of matter brought into existence by continuous development from older forms? Turning first to the inorganic world, we see that every present condition of the earth's surface has come by slow transformation out of an older condition. The delta of the Mississippi has grown, inch by inch, from its commencement at the mouth of the Ohio. The continent has advanced by continuous expansion from the primitive nuclear area to its present extent. The whole earth, as we have seen, has come into its modern condition through transformations of the same terrestrial mass. Entire systems of worlds are now understood to result from the secular evolutions of crude world-stuff. Scarcely a doubt remains, therefore, that throughout the realm

of inorganic nature events come into existence according to a method of evolution.

But many who recognize evolution in inorganic nature hesitate to admit that all organic things, as well, have come into existence through continuity with older organisms. That such, however, is the method of nature is shown by numerous proofs, which we may group into four classes.

First, we have the *morphological* proof. This is based on the structural resemblances of animals and plants. When we say two or three persons resemble each other, or seem to be members of a certain "family," we mean that they seem to have descended from some common ancestor. So, when we say the cat, the leopard, the cougar, the tiger, belong to the cat family, it is implied by the same reasoning that they are all descended from some common progenitor. The same is true of the members of the dog family, the horse family, and the other families of the animal and vegetable kingdoms. But when we compare two animals of different families, as a cat and a tortoise, we find still, in spite of their conspicuous contrasts, that they possess vastly more points of resemblance than of difference. The same reasoning may be extended even as far as the comparison of man and a beetle. We are thus led to the inference, at length, that all animals are descended from some common primitive stock. The evidence of rudimental structures belongs to the same class of proofs.

In the second place, we have the *paleontological* evidence. This consists in the graduated succession of organic beings through geological time. The gradation, as actually known, is not, it is true, complete. But our knowledge of the geological record is extremely imperfect. And every new discovery tends to close the gaps previously existing in our knowledge, and demonstrate that the actual succession was more complete than previous knowledge indicated. It is fair to presume that discoveries of this character will continue, and that thus we shall arrive eventually at a disclosure of a much more complete continuity of organic forms than is now proved. In view of the tenor and tendency of new discoveries, we may with the highest probability conclude that in the actual succession all the connecting links were present. If, therefore, the real history of life on the earth was a nicely graduated succession of organic forms from beginning to end, we discover ground for the final inference that these forms were connected by genealogical relationship.

Thirdly, we have the *variational* evidence. Every species possesses the susceptibility of variation. We do not know that variability is restricted within any limits. The variations of animals have been shown to sustain relations to geographical position, to changes in the environment, and to hybridity.

Fourthly, we have the *embryological* evidence. The embryonic history of any higher vertebrate presents a succession of phases. We have, for instance, the unicellular egg condition; then, in later stages, the morula, the planula, the gastrula, the turbellaria, the ascidia, and other stages. Here is a certain succession of forms. But the same succession of forms is exemplified in the embryonic history of any other vertebrate, or of any other animal; only the succession is continued in any particular case no farther than to the grade of the parent animal in that case. One ovum develops to the planula stage, and the embryo is complete; another develops to the turbellaria stage, and is there arrested. Thus we learn that two remarkable parallels exist. All embryonic histories are parallel with the embryonic history of the higher vertebrate as far as they extend; and again there is a gradation among adult animals which presents the same succession and constitutes another parallel. There is a type of adult animals for each of the numerous stages in the life of a vertebrate embryo.

Now in the embryonic succession it is demonstrable that the several terms are materially connected. We see the self-same egg substance transformed again and again, until it assumes the aspect of the adult animal. It is fair to presume, therefore, that in the same identical succession of forms disclosed in the ranks of the animal kingdom, and again disclosed in the succession through geological time, the same sort of material continuity has obtained. Should we feel reluctant to admit the proof to be absolute and final, we must certainly acknowledge that the conclusion is probable. If so, it is more reasonable to recognize evolution as the probable method of nature than to dogmatically deny it.

FUN AMONG THE STARS.

THERE are few things in science so dry and abstruse that a Yankee humorist cannot make them food for mirth. Even the mathematical details of astronomy can be twisted into laughable shape. One of our comic writers, referring to the fact that it would take a cannon-ball a hundred years or more to travel from the sun to the planet Saturn, remarked that the only practical suggestion to be drawn from the statement was that if the Saturnian people saw the flash of the gun they would have plenty of time for dodging the shot! In a kindred vein, one of our exchanges comments thus upon an article which appeared in the JOURNAL some months ago: —

We learn from the *Boston Journal of Chemistry* that, by the aid of the spectroscope, it has been discovered that "Arcturus is approaching us with a speed of fifty-four miles a second; and the one of the two 'Pointers' in the Great Bear which is nearer the pole is travelling towards us forty-six miles a second." And further, "The dog-star (Sirius) is describing a stupendous orbit round some invisible centre."

No intelligent man can listen to these facts without a feeling of lively interest in the situation, and curiosity, not to say anxiety, as to the result. The veil of mystery and apparent complexity which overhangs the *dramatis personæ* of the observation only adds to the fascination of the theme. As we ponder, imagination conjures up Arcturus, gay old sport, hurling his mighty spear against the Bear, who has been brought to bay by the two noble Pointers. The well-aimed shaft is turned aside by a sweep of the Bear's paw, and with a roar that shakes the firmament, and causes Orion's belt to slip way down over his hips, the beast rushes upon Arcturus. The latter, though undaunted, realizes that his only safety now is in flight. Being a Celestial, he feels an overwhelming conviction that he "must go," and with a confidence we shall never forget he turns to us in this, his hour of extremity. The time he is now making fairly justifies the wisdom of this decision, and we may consider Arcturus well out of danger.

The interest then centres upon the Bear and the Pointer, who seem to be coming along neck and neck. The latter, having the pole, is of course at an advantage, and ought to come in a good second; but all depends upon the relative staying powers of the contestants. About the other dog-star, Sirius, we do not exactly understand; he is a "pointer," we presume, although the strain is not definitely mentioned; but whether he was originally not taken on the expedition, or, being taken, was alarmed at the Bear's first onslaught, is not stated; he seems, however, for some reason, to have failed to start with the others, and at present appears to be conducting a hippodrome match against time on his own account. We await with interest further developments.

CHEMICAL CHRONOLOGY.

THE following chronological abstract of chemical history, from the London *Chemist and Druggist's Diary* for 1883, will interest many of our readers, besides being useful for future reference: —

Thales, of Miletus, declared that water was the original element of the universe about	B.C. 640
Pythagoras taught the importance of weighing and measuring about	550
Leukippos and Demokritus taught an atomic theory about	440
Aristotle, theories on form and motion and elements, died	322
Pliny, the elder, wrote "Historia Naturalis." Killed by the eruption of Vesuvius	A.D 79
Alexander, of Aphrodisia, first used the word "chemistry"	400
Geber discovered or described aqua fortis, aqua regia, lunar caustic, distillation, etc. Died	765
First stained-glass window in the Lateran Church	795
Rhasis discovered or described oil of vitriol and alcohol. Died	923
Albertus Magnus introduced alchemy into the West. Born	1193
Raymond Lully described preparation of nitric acid, "aqua prima." Died	1330
Basil Valentin, salts of antimony, spirits of salt, about	1410
Paracelsus applied chemistry to medicine. Born	1493
Galileo discovered thermometer	1597
Zacharias Jansen discovered microscope	1600
Harvey discovered circulation of blood	1619
Boyle founded chemical analysis. Born	1626
Torricelli and Viviani constructed barometer	1643
Otto von Guericke constructed air-pump	1650
Brandt discovered phosphorus	1669
Stahl introduced phlogiston theory	1697
First sulphuric acid lead chamber erected by Roebuck, in Manchester	1746
Marggraf discovered sugar in beet	1747
Franklin proved nature of lightning	1752
Black described fixed air	1757
Priestley discovered oxygen (dephlogisticated air)	1774
Scheele discovered chlorine	1774
Lavoisier explained the nature of air, oxygen, etc.	1775
Cavendish discovered hydrogen	1784
Berthollet introduced bleaching by means of chlorine	1789
Leblanc invented alkali manufacture	1791
Volta's pile discovered	1795
Achard erected first beet-sugar manufactory	1796
Rene Just Haüy founded crystallography	1801
Dalton published his laws of multiple proportion and atomic theory	1801
Murdoch introduced gas-lighting at Manchester	1804
Malus discovered polarization of light	1808
Davy discovered sodium	1808
Gay-Lussac published his volume theory	1809
Avogadro's law published (equal volumes of gases at same temperatures and pressure contain an equal number of molecules)	1811
Berzelius, electro-chemical theory	1819
Mitscherlich's discovery of isomorphism	1819
Dulong and Petit, law of specific heats	1819
Oersted discovered electro-magnetism	1820
Unverdorben discovered aniline	1826
Wöhler artificially prepared urea	1829
Niepce and Daguerre discovered photography	1829
Faraday discovered magneto-electric induction	1832
Liebig and Wöhler's investigations on the benzole compounds	1832
Laurent and Gerhardt's type theory	1837
Dumas' substitution theory	1839
Liebig published "Agricultural Chemistry"	1840
Mayer's mechanical-heat theory	1842
Frankland's theory of atomicity of the elements	1852
Berthollet's works on glycerine	1853
Hofmann's works on aniline colors	1858
Development of equivalence theory by Frankland, Kolbe, Kekula, Couper, Odling, Wurtz, Cunnizaro, etc., from	1858
Kirchhof and Bunsen introduced spectrum analysis	1859
Lieberman and Graebe prepared artificial alizarin	1861
Cailletet and Pictet liquefied various gases	1877
Baeyer discovered synthesis of indigo-blue	1878

ENGLISH CULINARY RECIPES.

SOME of our readers may be interested in the following characteristic samples of English culinary recipes which we cull from our foreign exchanges: —

MINCE MEAT. — Stone 2 lbs. of Valencia raisins; pick free from stalks 2 lbs. of sultanas; wash and thoroughly dry 3 lbs. of currants; grate the peel off half a dozen lemons and the same number of Seville

oranges, taking care not to break through the pith; take the pulp of both, and after freeing it from seeds and skin put it with the juice to the rest of the fruit; rub 2 oz. of ground cinnamon and 1 oz. of ground ginger into 3 lbs. of brown sugar; add that also, mixing it well, and lastly putting in 2 lbs. of finely-minced apples. Have ready a quantity of well-minced kidney suet; then weigh 3 lbs. of the fruit mixture, and put it to 1 lb. of the minced suet; blend them thoroughly, and put them into a deep jar, pressing well down; proceed till the whole of the mixture is used up. A glass of rum or brandy poured over each 4 lbs. as it is pressed into the jar will improve the flavor and assist the keeping properties.

When used for a plum pudding, to each 3 oz. of the mixture add one egg and 1 oz. bread crumbs; tie in a floured cloth or a buttered mould, and the pudding is ready all but the boiling. For mince pies season strongly with Jamaica pepper and ground cloves. For a kitchen or family pudding, make a rather plain suet or butter and lard crust, roll out, and spread a spoonful or two of the mixture over it, then proceed as with an ordinary roly-poly.

Beefsteak Pudding. — Sift a teaspoonful of baking-powder with two cupfuls of flour; add half a pound of beef suet or butter, chopped very fine, and one cupful of water. Mix and roll out; line a well-buttered pan with this pastry; cut two and a half pounds of round-steak in neat scallops, and mince a small onion fine; place a layer of meat on the paste, season with the onion, and with salt, pepper, thyme, and parsley, then another layer, and season, and so on till the steak is all used; fill up with cold water, cover it with paste; place a buttered paper over, set in a saucepan with boiling water to reach two-thirds up the outside of the mould. Steam this two and a half hours, turn carefully on a dish, and serve with any kind of meat-gravy.

MUMMY GARLANDS.

Several of the royal mummies discovered last year at Dayr-el-Baharee were, it will be remembered, found garlanded with flowers; these flowers being, for the most part, in as perfect preservation as the specimen plants in a *Hortus siccus*. M. Arthur Rhoné, in a recent letter to *Le Temps*, has described the extremely curious way in which these garlands are woven. They consist of the sepals and petals of various flowers detached from their stems, and enclosed each in a folded leaf of the Egyptian willow. The floral ornaments thus oddly devised were then arranged in rows (the points being all set one way), and connected by means of a thread of date-leaf fibre, woven in a kind of chain-stitch. The whole resembles a coarse "edging" of vegetable lace-work. Among the flowers thus preserved are *Delphinium orientalis* (a species of larkspur); *Nymphæa cærulea* or *Nymphæa lotus* (pond lily); *Sesbunia Ægyptæa* (belonging to *Leguminosæ*); and *Carthamus tinctorius*, so largely employed as a dye by the ancient inhabitants of the Nile valley. The dried fruit as well as the dried yellow blossom of the *Acacia Nilotica* is likewise present, and mention is also made of the blossom of a species of watermelon now extinct.

The foregoing are all interwoven in the garlands in which the mummy of Amenholep I. was elaborately swathed. With others of the royal mummies were found fine detached specimens of both kinds of lotus, the blue and the white, with stems, blossoms, and seed pods complete. Still more interesting is it to learn that upon the mummy of the priest Nebsooni, maternal grandfather of King Pinotem II. (twenty-first dynasty), there was found a specimen of the lichen known to botanists as *Parmelia forforacea*. This plant is indigenous to the islands of the Greek Archipelago, whence it must have been brought to Egypt at or before the period of the Her-Hor dynasty (B. C. 1100 or B. C. 1200). Under the Arabic name of "Kheba," it is sold by the native druggists of Cairo to this day. These frail relics of many a vanished spring have been arranged for the Boolak Museum with exquisite skill by that eminent traveler and botanist, Dr. Schweinfurth. Classified, mounted, and, so to say, illustrated by modern examples of the same flowers and plants, they fill eleven cases, — a collection absolutely unique, and likely ever to remain so. The hues of these old-world flowers are said to be as brilliant as those of their modern prototypes; and but for the labels which show them to be three thousand years apart, no ordinary observer could distinguish between those which were buried with the Pharaohs and those which were gathered and dried only a few months ago.

SCIENTIFIC BREVITIES.

Alteration in Flour through the Action of the Sun. — It frequently happens that wheat or rye flour, in spite of the greatest care in baking, yields an inferior loaf, and the failure is commonly attributed to adulteration; but when submitted to investigation neither microscopic nor chemical tests reveal any adulteration. Such flour is returned to the miller or dealer as unfit for use. The miller says the flour was injured by the heating of the stones, and the dealer attributes the defect to the circumstance that the sun must have shone upon the sacks during transportation. It has been proved by numerous experiments that flour cannot bear the action of the sun, even when not exposed directly to its rays. When flour is exposed to the heat of the sun an alteration takes place in the gluten similar to that produced by the heating of the stones. For this reason it is advisable that the transportation of flour should take place, if possible, on cool days or by night, as well as that flour should be stored in a cool place.

A New Galvanometer. — A simple galvanometer, free from all magnetic actions, is described by M. Dubois in a letter to *La Lumière Electrique*. It is based on Joule's law, and is merely a Breguet thermometer, the spiral of which is formed of a fine strip of platinum and zinc, or of platinum and iron, which is traversed by the current to be measured. To compensate variations of external temperature, the spiral traversed by the current is suspended by means of a second quite similar spiral turning the opposite way. The first spiral has a pointer near its lower end, which end dips in a mercury cup, while an annular cup of mercury serves for the upper contact, the current passing half up one support, then down the strip. The sensibility of the instrument is said to increase with the intensity of the current.

Insect Life. — It is estimated that there are five times as many kinds of insects as there are species of all other living things put together. The oak alone gives shelter and support to 450 species of insects, and 200 kinds make their home in pine-trees. In 1849, Alexander von Humboldt estimated that the number of species preserved in collections was between 150,000 and 170,000, but scientific men now say that there must be something like 750,000 species.

The Resistance of the Air to the Motion of Bullets in Guns. — Professor Colladon, of Geneva, recently described a curious experiment showing the resistance of the air under certain circumstances to the motion of bullets in guns. He charged the hollow iron breech of an air-gun, serving as a reservoir, with compressed air, and, having screwed up the gun, introduced a round lead ball, running freely, but nearly filling the bore; then, placing the gun in a vertical position, he seized the upper end, and pressed his thumb vigorously on the mouth. The gun was then "fired" by an assistant; the thumb remained in position, and the ball was heard to fall back in the bore. Thereupon, after recharging the breech and with the same ball, he shot the latter at a pine board, about four inches thick, on a pane of glass, and it passed through. The experiment, M. Colladon says, is without danger if the operator is quite sure of the strength of his thumb, if the gun is more than 32 inches long, and if the ball is spherical and nearly fills the gun, in which it must act like a piston.

Light Penetration in Water. — Professor Forel, practising with the albuminized paper of photographers, reached the conclusion that light cannot penetrate water to a greater depth than about 125 ft. More recently, however, some more sensitive plates have been exposed at a depth of 300 ft. under water, and the traces of light were distinctly left on the plates. Light must therefore penetrate clear water at least 300 ft., while rays so feeble as to escape detection by any known means, and yet so powerful as to exert an influence upon some forms of sub-aqueous life, may reach still greater depths.

HINTS FOR EXPERIMENTS.

An Optical Experiment. — It is known that white light may be wholly extinguished in passing through two colored glasses of pure and different colors, as, for example, a red glass and a green glass. To prove this in a lecture, Professor Dubois takes two pieces of wood (like those used for lantern-slides), with equal circular openings in the middle. Two rectangular pieces — one of green, the other of red, glass — are, by means of screws, fixed between the wooden pieces at right angles, one edge of each crossing the hole diametrically. The circle obtained in projection is divided into four sectors, — one white, another red, another green, and another black; the last being that in which the two pieces of glass are superposed. This experiment is the opposite of that which consists in superposing, by projection on a white screen, a red beam and a green beam, giving white (red and green being complementary).

Imitation Flowers made with Liquid Films. — A pretty experiment has been recently described by the well-known Belgian physicist, M. Plateau. He bends fine iron wire so as to present the contour of a flower of six petals. The central ring to which the petals are attached is supported on a forking stem, which is stuck in a piece of wood. After oxidizing the wire slightly with weak nitric acid, the flower is dipped in glyceric liquid, so as to receive films in the petals and the central part. It is then turned up, placed on a table near a window, and covered with a bell jar. For a little time it appears colorless, but soon a striking play of colors commences. In the experiment M. Plateau describes, the flower continued showing modifications of color for ten hours, when dusk stopped observation. Next morning several petals had burst. The liquid used was of very mediocre quality. M. Plateau recommends preparation of the liquid thus: Dissolve a fresh piece of Marseilles soap, cut up into small pieces, in 40 parts by weight of hot distilled water. Filter after cooling, and mix thoroughly three volumes of the solution with two of Price's glycerine. The solution should be left at rest till all air-bubbles are gone.

Illustration of Inertia. — An interesting experiment, illustrating the force of inertia and molecular resistance, is given in *La Nature*. It was first performed, and with a practical purpose, by a Corsican, under the second empire. Place a sealed piece of wax on an anvil, or well-supported iron plate, and over it a round ball of cast lead (not compressed), of diameter corresponding to its width. Now give the ball a sudden violent blow with a

hammer. The flattened ball is found to have taken the impression of the sealed wax in its least details, and without breaking it (if the experiment is properly done). With the aid of this matrix the seal may be copied.

EXPERIMENT IN ACTION AND REACTION. — The *English Mechanic* says: Every one knows the classic experiment in which one terminal ball of a row of suspended ivory balls is separated and let fall against its nearest neighbor, whereupon only the ball at the other end moves, and with a velocity equal to that of the first at the moment of impact. M. Trève improves the experiment by putting metallic dust on the top of each ball. This is projected in the direction of the shock, but not all of it, — only (supposing the shock to be from left to right) that part on the right half of the intermediate balls. In the last ball the dust is projected from the opposite side to that of the shock. M. Trève supposes the ether between the material molecules to be compressed in the direction of the shock, and to carry with it the molecules of each ball. At the moment of decompression the ether and the molecules return together to their original positions.

NEW SYMPATHETIC INK. — A formula is published in the Continental journals for an ink which can be used on paper, and which is visible only when the paper is wetted. It will disappear as the paper dries, to reappear at each wetting. The ink is an emulsion consisting of 1 part of linseed oil, 20 parts of ammonia, and 100 parts of water.

Practical Chemistry and the Arts.

THE GAS-LIGHT OF THE FUTURE.

MUCH time has been wasted in fruitless disquisitions on what the "light of the future" will be. There is no reason to doubt that posterity will continue to make use, to a greater or less extent, of the three chief illuminants now in use, namely, gas, oil, and electricity. Each will have its own proper sphere, and each will possess, under certain conditions, advantages that are wanting in the others. Petroleum will doubtless long hold sway in the poor man's cabin and in the isolated cottage, while gas and electricity will meet each other in a fair fight in the open field, to decide their relative merits as illuminants for the urban home and the public thoroughfares. But the gas-light of to-day is doomed to extinction, sooner or later; it may be within a decade, it may not be within a century. Gas must be made cheaper, or it must be made to give more light, if it would hold its own against electricity. Even in the present imperfect state of the latter, it has been proven experimentally that more light can be obtained from one hundred cubic feet of gas, by burning it in a gas-engine, which is made to run a dynamo machine, that supplies the electricity for an Edison or Swan light, than by burning the same gas in an argand burner. By the use of an arc light far more light would be obtained from the same amount of power.

Inventors have already directed their attention to improvements in gas-burners, to gas-making, and to the enriching of gas, whereby its illuminating power is increased. A few of these will claim our attention.

The *Albocarbon burner*, which has attracted considerable attention, carburets the gas, just before it is burned, with naphthaline vapors. The burner consists of a conical vessel, about three inches in diameter, filled with pieces of naphthaline, over which the gas passes before it is burned. The flame itself is so near this vessel that it heats the naphthaline sufficiently to volatilize it, and its vapor carried into the flame increases its luminosity. According to Rudorff's experiments, it takes nearly an hour to heat the vessel containing the naphthaline so as to obtain the best effects.

F. Siemens, in Dresden, has devised two or three forms of gas-burners intended to heat the gas before it is burned, and likewise the air which supports its combustion. This increases the illuminating power, in some cases, as much as 150 per cent. Unfortunately, the apparatus is exceedingly complicate in construction.

Another device for increasing the quantity of light obtained from a given quantity of gas consists in placing in the flame an infusible substance, which becomes heated to incandescence, and emits light of its own; it is, in short, a device for converting heat into light. Platinum, notwithstanding its high melting point, does not well endure such treatment: the hot carbon of the flame alloys itself with the platinum and makes it brittle; the sudden changes of temperature also affect it, so that it is scarcely probable that platinum will find use here. Iridium and the other infusible metals are far more expensive than platinum, while they are also more brittle. Oxides of lime, magnesium, or zirconium offer better hopes for success, as they have withstood the high temperature of the oxy-hydrogen light; and to these, or similar substances, we believe inventors should direct their attention.

In this connection we may mention the Clamond lamp, in which the air is heated, then mixed with the gas and directed against a basket of magnesium thread, which it heats to incandescence. The disadvantage of this lamp is a serious one, inasmuch as it requires the air to be supplied to it under pressure. This involves the use of a double system of piping in the house, as well as a means of applying power, although the latter can be accomplished cheaply by a system of blowers and weights.

A little study of the subject will convince any one that none of the methods yet proposed or introduced practically utilize all the potentiality of the gas. If all the heat produced by the combustion of ordinary illuminating gas could be economically converted into light, we should be at least one step nearer the solution of our problem. The generally accepted theory of flame attributes the luminosity to particles of incandescent carbon floating in the flame. Frankland's theory, however, assumes that, instead of free carbon, it is a heavy hydrocarbon, which, becoming highly heated, gives out luminous rays. Be that as it may, every form of gas-lighting now in use necessitates the presence of a large quantity of carbon in the gas burned.

Were some other incandescent body, like platinum or chalk, to take the place of the carbon, any combustible gas, like hydrogen, could be employed to heat it to the necessary temperature. This would materially reduce the cost of making the gas, for it is well known that poor gas (say, ten-candle gas) can be made much more cheaply than good gas, of, say, twenty-candle power. There are two reasons for this: first, rich gas can be made only from a rich coal, which of course costs more than poor coal; and, secondly, the larger the quantity of gas obtained from a given weight of the same coal, the poorer its quality.

Hitherto we have spoken only of coal gas. There is, however, another kind of gas, called "fuel gas," made by the action of red-hot coal on superheated steam, which cannot at present be used for illumination without first "enriching," an operation that greatly increases the cost of manufacture. In the city of Yonkers, N. Y., this fuel gas is sold at fifty cents per 1000 cubic feet, for cooking and heating purposes.

Probably this gas could be burned in the Clamond lamp, but the invention of a burner in which it could be burned, without the aid of a blast of air, would put a very cheap form of illumination in the hands of those who have fuel gas at their disposal. To fit it for use for illumination, this gas should be partially purified, removing the sulphur compounds: else it would vitiate the air of the room worse than coal gas does at present, by sulphurous and sulphuric acids. In all forms of illumination, excepting by electricity, carbonic acid is evolved, and should be carried off by special flues. H.

HOW TO TAKE OUT SCREWS FROM WOOD-WORK.

THE following practical hints on this subject are from a long article in the London *Builder* on "The Use and Abuse of Screws in Woodwork," and may save our readers much vexatious effort, not to say profanity, in the extraction of old and obstinate screws: —

A difficulty is often experienced by persons who wish to withdraw a screw, by finding that though it will turn round under the application of the screw-driver, yet it will not unscrew out. In this case a well-grounded suspicion may be entertained that the screw in question was driven, or nearly driven, home originally by the hammer, instead of gradually by the screw-driver, and that no regular thread corresponding with the screw exists in the wood. Under such circumstances it becomes necessary often to wrench off the hinge or hinges by force, at the risk of their breaking, and this often happens. When hinges have lain undisturbed for long years on old doors or other framings, perhaps for a quarter of a century or double that time, it becomes difficult to extract the screws, although they may have been originally properly driven. This arises from the screws rusting in the wood, and sometimes from other causes. Workmen themselves often fail to withdraw a screw, and are forced to break the hinge to enable them to get under the head of the screw, and wrench it out. They often split, and break too, fancy and delicate wood-work articles, in their efforts to take off hinges, locks, mountings, and other finishings, despite that simple methods exist for extracting screws that have rusted in the wood. One of the most simple and readiest methods for loosening a rusted screw is to apply heat to the head of the screw. A small bar or rod of iron, flat at the end, if reddened in the fire and applied for a couple or three minutes to the head of the rusted screw, will, as soon as it heats the screw, render its withdrawal as easy by the screw-driver as if it was only a recently inserted screw. As there is a kitchen poker in every house, that instrument, if heated at its extremity, and applied for a few minutes to the head of the screw or screws, will do the required work of loosening, and an ordinary screw-driver will do the rest, without causing the least damage, trouble, or vexation of spirit. In all work above the common kind, where it is necessary to use screws, and particularly in hinge work and mountings, fancy fastenings and appliances affixed to joinery or furniture work, we would advise the oiling of screws or the dipping their points in grease before driving them. This will render them more easy to drive and also to withdraw, and it will undoubtedly retard for a longer time the action of rusting.

SOLDERING WITHOUT AN IRON.

THE following method for soldering without the use of a soldering iron is given in the *Techniker*: —

The parts to be joined are made to fit accurately, either by filing or on a lathe. The surfaces are moistened with the soldering fluid, a smooth piece of tinfoil laid on, and the pieces pressed together and tightly wired. The article is then heated over the fire by means of a lamp until the tinfoil melts

In this way two pieces of brass can be soldered together so nicely that the joint can scarcely be found.

With good soft solder, nearly all kinds of soldering can be done over a lamp without the use of a "bit." If several places have to be soldered on the same piece, it is well to use solder of unlike fusibility. If the first piece is soldered with fine solder, composed of 2 parts of lead, 1 of tin, and 2 of bismuth, there is no danger of its melting when another place near it is soldered with bismuth solder, made of 4 parts of lead, 4 of tin, and 1 of bismuth, for their melting points differ so much that the former will not melt when the latter does. Many solders do not form any malleable compounds.

In soldering together brass, copper, or iron, hard solder must be employed: for example, a solder made of equal parts of brass and silver. For iron, copper, or brass of high melting point, a good solder is obtained by rolling a silver coin out thin; for it furnishes a tenacious compound, and one that is not too expensive, since silver stretches out well. Borax is the best flux for hard soldering. It dissolves the oxides which form on the surface of the metal, and protects it from further oxidation, so that the solder comes into actual contact with the surfaces of the metal. For soft soldering, the well-known fluid, made by saturating equal parts of water and hydrochloric acid with zinc, is to be used. In using common solder rosin is the cheapest and best flux. It also has this advantage, that it does not rust the article that it is used on.

INDUSTRIAL MEMORANDA

An Asphalt Mortar. — The *Centralblatt der Bauverwaltung* describes a patented composition made at a factory in Stargard, Pomerania, which has for some years past been used with perfect success on the Berlin-Stettin railway for wall copings, water-tables, and similar purposes requiring a waterproof coating. The material is composed of coal-tar, to which are added clay, asphalt, resin, litharge, and sand. It is, in short, a kind of artificial asphalt, with the distinction that it is applied cold, like ordinary cement rendering. The tenacity of the material, when properly laid, and its freedom from liability to damage by the weather are proved by reference to an example in the coping of a retaining-wall which has been exposed for four years to the drainage of a slope 33 feet high. This coping is still perfectly sound, and has not required any repair since it was laid down. Other works have proved equally satisfactory. In applying this mortar, as it is termed, the space to be covered is first thoroughly dried, and after being well cleaned is primed with hot roofing varnish, the basis of which is also tar. The mortar is then laid on cold, to the thickness of about three eighths of an inch, with either wood or steel trowels, and is properly smoothed over. If the area covered is large, another coating of varnish is applied and rough sand strewn over the whole. The waterproof surface thus made is perfectly impregnable to rain or frost, and practically indestructible. The cost of the material laid is estimated at not more than 10 cents. per square foot, and it is stated that this price can be reduced by at least 2 cents for large quantities put down by experienced workmen.

The Subterranean Quarries of Paris. — Frequent instances of subsidence of the surface soil having occurred in several quarters of Paris, the municipal authorities are bestirring themselves with a view to consolidating the sub-soil of the capital. A plan of the great subterranean quarries that extend under the Bois de Vincennes and the neighboring districts has been prepared, and the necessary work to be undertaken has been settled. The first portion, which consisted of strengthening the quarries under various public thoroughfares in the 13th, 14th, 15th, and 16th arrondissements, over a total length of 2000 yards, is already finished. In many places it was found absolutely necessary to construct piers, and fill in the spaces between them with ballast, etc. No less than 6280 cubic meters of masonry and 10,700 meters of earth and sand were used, while the cost of this comparatively small section amounted to about $50,000. It is expected that the complete execution of the work will necessitate an expenditure of many millions of francs.

Alcohol and Paper from Wood. — The *Oesterreichischer Liquer Fabrikant* states that Messrs. Bochet & Machard now prepare both alcohol and paper from wood: 2000 kilos. of wood shavings are treated in wooden vats with 8000 kilos. of water and 800 kilos. of hydrochloric acid for 10 to 12 hours, steam being passed in the whole time, so as to keep the mass on a constant boil. When this operation is over the acid liquid is run off, neutralized with chalk, and fermented at a temperature of 24°–25° C. The ligneous residue in the vats is washed and dried and worked up for paper.

Poisonous Dyes in Stockings. — Dr. J. Woodland writes to the London *Sanitary Record* that, having had his attention directed to several cases of great irritation of the feet and legs, causing small pustules to arise and the skin to subsequently exfoliate, and suspicion being fastened upon red stockings which the patients wore, he carefully analyzed them. He found a tin salt which is used as a mordant in fixing the dye. He succeeded in obtaining as much as 22.3 grains of this metal in the form of the dioxide, and as each time the articles are washed the tin salt is rendered more easily soluble, the acid excretions from the feet attack the tin oxide, thus forming an irritating fluid.

Oil of Sunflower Seeds. — In Russia the sunflower is extensively cultivated for the oil the seeds contain. The oil is palatable, clear, and flavorless, and is used for adulterating olive oil, being exported from St. Petersburg to the shores of the Mediterranean Sea. Next to poppy-seed oil, sunflower oil burns the clearest and longest, so that the peasants apply it to household purposes. From the stalks of the plants they also make a good quality of potash, and the residue of the seeds, after the oil is extracted, is made into oil cake.

Wanted, an Understanding. — An Illinois merchant, who was taking baking-powder in bulk from a Chicago firm, called at headquarters, the other day, to say that there was something wrong with the goods. "I don't think so," was the reply; "we make the best article sold in the West." "I think we ought to have a more perfect understanding," continued the dealer. "Now, then, you adulterate before you send to me, then I adulterate before I ship, then the retailer adulterates before he sells, and the consumer can't be blamed for growling. I wanted to see if you could n't agree on some schedule to be followed." "What do you mean?" "Why, suppose you put in 10 per cent. of chalk, then I put in 20 per cent. of whiting, then the retailer puts in 30 per cent. of flour; that gives the consumer 40 per cent. of baking-powder, and unless he 's a born hog he 'll be perfectly satisfied. You see, if you adulterate 50 per cent. on the start, and I adulterate as much more, and the retailer adulterates as much as both together, it 's mighty hard for the consumer to tell whether he 's investing in baking-powder or putty; we must give him something for his money, if it 's only chalk."

LABORATORY NOTES.

A New Test for Glucose. — Dr. George Johnson reports, in the London *Lancet*, that he has discovered somewhat accidentally, a very delicate test for grape sugar. When equal volumes of liquor potassæ and a saturated solution of picric acid are mixed, there is usually a precipitate of picrate of potash; on boiling the mixture the precipitate is dissolved, and forms a transparent orange-red liquid. On the addition of a small quantity of solution of grape sugar the color is deepened to a purple, almost a black. With a solution of cane sugar no change of color occurs; but if the cane be converted into grape sugar by boiling with hydrochloric acid, the effect is at once produced. It appears that the effect of the picric acid is to increase to an extraordinary degree the delicacy of Moore's well-known test for glucose. The author has ascertained that a solution of crystallized picrate of potash boiled with a solution of grape sugar causes no change of color; the presence of caustic potash in excess is essential for the development of the reaction. He has also ascertained that 1.5 part by weight of grape sugar dissolved in 10,000 parts of distilled water may readily be detected by this test.

Another Test for Albumen in Urine. — Dr. W. Roberts states in the *Lancet* that a saturated solution of salt in a fluid composed of 1 ounce of dilute sulphuric, nitric, or hydrochloric acid, with a pint of water, filtered, provides a test for albumen in urine as delicate as nitric acid. It should be applied in the same way by trickling the solution down the sides of a test-tube containing the urine, held in a slanting direction. The brine solution should be added in quantity equal to the urine, and if albumen be present it will be visible at the point of contact of the two liquids. This test is advantageous in the case of high-colored urines, which are made darker by nitric acid, and the brine solution is also less dangerous to carry in a pocket-case than the nitric acid.

Neat and Simple Mode of Labelling Chemical Glassware. — We learn from *New Remedies* that Dr. R. Müncke, the well-known maker of chemical glassware, proposes, as an improvement in beaker glasses, the roughening of a surface upon one side by grinding, so that it can be written upon with a lead-pencil. Since the carbon of the pencil-mark is practically indestructible by acids and alkalies, this simple measure might well be resorted to for reagent bottles, flasks, and many other vessels used in chemical and pharmaceutical work, thus enabling the operator to note the contents or uses of any glass vessel without resorting to a paper label.

PRACTICAL HINTS.

Cement for Rubber. — Powdered shellac is softened in ten times its weight of strong water of ammonia, whereby a transparent mass is obtained, which becomes fluid after keeping some little time without the use of hot water. In three or four weeks the mixture is perfectly liquid, and, when applied, it will be found to soften the rubber. As soon as the ammonia evaporates the rubber hardens again, — it is said quite firmly, — and thus becomes impervious both to gases and to liquids. For cementing sheet rubber or rubber material in any shape to metal, glass, and other smooth surfaces, the cement is highly recommended.

Driving Nails into Hard Wood. — The editor of the New Genesee *Farmer* has lately witnessed an experiment of driving nails into hard seasoned timber, fairly dried. He says that the first two nails, after passing through a pine board, entered about one inch, and then doubled down under the hammer; but on dipping the points of the other six or eight nails into lard, every one was driven home without the least difficulty. Carpenters who are engaged in repairing old buildings sometimes carry a small lump of lard or tallow for this purpose on one of their boots or shoes.

Hardening Plaster Casts. — This can be done by boiling the cast for about half an hour in a strong solution of potash alum. Another way is

to dry the plaster, and soak it repeatedly in weak shellac varnish until it will absorb no more, — allowing it to dry between each soaking. This can be done with a camel-hair brush quite as well as by dipping the cast in the varnish.

Agriculture.

SORGHUM.

It appears to be a pretty well established fact that we have in sorghum a source of crystallizable sugar which is worthy of the attention of Northern farmers. The late United States Commissioner of Agriculture has been ridiculed considerably for his persistent experiments with sorghum, and his efforts to introduce the plant to the attention of farmers in the colder sections of the country; but, notwithstanding this ridicule, he accomplished a good work, and if the present commissioner is more "ornamental" than Le Duc, we hope he will prove none the less useful than his predecessor.

The credit of the researches upon sorghum is, however, more directly due to the chemist of the department, who toiled for several years in the laboratory and among farmers, with the view of establishing on a practical basis the sorghum-sugar industry. The disasters attending the beet-sugar experiments in this State and in Maine will serve as a beacon light to warn farmers against any further ventures in the line of the sugar industries, unless the practicability and pecuniary results are fully established.

Sorghum has many decided advantages over beets as a source of sugar, and these advantages are easily pointed out: —

(1.) It is a plant which grows luxuriantly upon our Northern soils, and does not require the care or labor which must be bestowed upon a beet crop. It is, like corn, a crop which withstands droughts well; is not materially injured by early frosts; does not require excessive manuring. It does not exhaust soils any more than does a crop of corn for ensilage; the residuum, after the sap is removed, can be returned to the soil as manure, or can be fed to animals under certain conditions.

(2.) It can be preserved for manipulation much better than beets; it is not so perishable; it can be stored easier, and handled more conveniently.

(3.) The percentage of cane sugar in sorghum is nearly, or quite, double that of beets, which is its crowning advantage.

Mr. H. B. Blackwell, who was connected with the Maine Beet Sugar Factory, has become much interested in sorghum, and has written us a letter upon the subject, extracts from which we present below: —

I have made some interesting and important experiments this fall in the manufacture of sugar from sorghum, of the Early Amber and White Siberian varieties, raised in my garden at Dorchester, Mass., from seed obtained from the United States Department of Agriculture. I found no difficulty in making thirteen per cent. of crystallized sugar on the weight of the canes, and six per cent. of excellent syrup in addition by the diffusion process. For three years my company (the Maine Beet Sugar Company), with the best machinery, averaged only seven per cent. of sugar and three per cent. of syrup from beets raised in New England. So that I have made, over the open fire and with no proper appliances, twice as much from the same weight of sorghum.

To confirm the results of my experiment, I had Mr. S. P. Sharples make an analysis of the clarified juice of my sorghum. It is as follows: —

Water	78.18
Cane sugar	18.00
Inverted sugar	2.09
Ash	0.89
Gum, etc.	0.84
	100.00

The large proportion of ash was due to the use of lime and phosphoric acid by me, in the process of defecation. . . . Our beet-sugar operations had to be abandoned after making $200,000.00 worth of sugar and syrup, for want of a supply of beets. The great point is to secure a sufficient supply of raw material to justify the erection of a factory.

Mr. Blackwell is of the opinion that the State should encourage the sorghum-sugar industry, by offering a bounty of one dollar a ton to sorghum raisers; and we are inclined to coincide with him in this view.

We never had confidence in the success of the beet-sugar experiments in this country, as our readers well know. We had studied too carefully the industry in France and Germany to fail to see the immense disadvantages under which it must labor, with our system of husbandry, and with the extreme cold of our late fall months.

The raising of sorghum is a matter worth considering, and should receive attention at the hands of our legislators and farmers.

SOURCE AND VALUE OF NITROGEN IN AGRICULTURE.

It is singular that at this late period a lively discussion should arise among chemists and experimenters as regards the value of nitrogen in manures, or, indeed, whether it has *any* value. Mr. Sharp, of Baltimore, a chemist who owns a farm near that city, contends that it has none, and consequently all the money expended in nitrogenous fertilizers is thrown away. Even the astute and experienced Dr. Lawes, of Rothamsted, exhibits signs of doubt as regards the correctness of former views upon the question.

The nitrogen question is certainly one of the most important which now engages the attention of agricultural chemists, and it may be that some modification of views is necessary. Two things are certain: one, that all important plants contain nitrogen; the other, that the soil receives from some source immense quantities of this element. Beside what is taken up by plants, experiments show that large quantities are washed away by rain-water and lost.

The splendid researches of Messrs. Schloesing and Muntz, in Germany, and Mr. Warrington, in England, have established the fact that the phenomenon of nitrification in the soil and in organic liquids is due to microscopic organisms. Pasteur asserts that these organisms belong to the class called *anerobes*, and when cultivated at the surface of a liquid in contact with air become inactive, or nearly so. A still more curious result has been reached in the researches of Messrs. Gayon and Dupetit. These results seem to show that there is an inverse reaction in soils and liquids caused by the organisms; that, when nitrogenous compounds are brought in contact with them, they are decomposed with the evolution of free nitrogen. This whole matter is at present inexplicable, but further researches may let in more light. It is certain that soils receive, from chemical changes and the air, great quantities of nitrogen, and it may be that we shall some day learn how to utilize it, so that the enormous cost of supplying it to crops may be saved.

MANURE FROM BLOOD.

At a recent meeting of the French Academy of Science, M. Debray, on behalf of M. Marguerite, Delacharlonny, made a communication, important from a sanitary as well as from an economical point of view, as to the formation of a solid and inodorous manure from the blood of animals by means of sulphate of iron. The dried blood of animals is very rich in nitrogen, containing as much as from 15 to 17 per cent.; but the processes hitherto employed for turning it into manure have constituted such a nuisance that they have been, of necessity, abandoned. In the sulphate of iron process, which has been employed for some time past, the blood is coagulated by a small quantity of this salt in solution, which arrests decomposition, and the pasty mass thus formed is dried in suitable vessels. This process, however, has only yielded incomplete results at considerable cost, but it has been improved by the above-named inventor, by employing a more active coagulating agent. The chief point to be attended to is the rapid elimination of water, which constitutes a large portion of the blood when in a liquid state. By employing as a coagulant the acid sulphate corresponding to a formula $Fe_2O_34SO_3$, the natural elimination of the water amounts to nearly half the whole quantity, thus reducing the cost of evaporation, which renders the ordinary process so expensive. Desiccation is completed, either cold, by compression under the hydraulic press, or hot, in a drying chamber.

PULVERIZING FERTILIZERS.

To any one familiar with chemical processes it "goes without saying" that solid substances used as fertilizers should be as finely divided as possible; but the average farmer may profit by the advice and illustrations given in the following extracts from an article by Dr. Caldwell in the *N. Y. Tribune*: —

Costly commercial fertilizers should be finely pulverized. This principle is generally recognized in the case of such manures as bone meal, animal meal, and fish guano, that are slowly dissolved in the soil; at the experiment stations in this country one sixth more is allowed per pound for nitrogen and one fifth more for phosphoric acid in fine-ground bone meal than in medium fine bone. But the principle is applicable not only to such as these, but also to some fertilizers containing soluble plant food, as superphosphate.

Wagner recently compared the effect of a very finely powdered superphosphate with a granulated one, in which the grains were no larger than from one tenth to one twentieth of an inch in size: in pot culture with peas he obtained in every instance a larger yield with the former; in six experiments with each the quantities of phosphoric acids supplied were 25, 50, 75, 100, and 150 pounds, respectively; calling the yield with no manure 100 pounds, the yields with the powdered phosphate were 120, 131, 144, 149, 161, and 169 pounds, but with the

granular manure 103, 111, 133, 135, 145, and 142 pounds.

Some time ago a French chemist found that water charged with carbonic acid, and therefore somewhat resembling in its solvent effect the water of the soil, dissolved nearly eight times as much from a sample of rock phosphate in impalpable powder as from the same phosphate in grains about a tenth of an inch in size, and nearly twice as much as from the phosphate in grains about a twentieth of an inch in size. For quick returns from fertilizers farmers should see to it that what they buy is in the finest possible powder, as well as rich in plant food, no matter whether it be a bone meal or a superphosphate.

THE FOOD VALUE OF COTTON-SEED.

An interesting paper has been read on this subject by Professor Gulley before the Society for the Promotion of Agricultural Science at Montreal. It seems that our crop of cotton-seed amounts to 3,000,000 tons, or 180,000,000 bushels; and that during the past year the oil mills consumed 180,000 tons of seed in the manufacture of cotton-seed oil, while less than one half of the remainder was used for fertilizers, seed, and feeding stock, the balance being a total loss. The greatest value of the oil (which has hitherto been used for a variety of other purposes) is now found to be in culinary purposes. Perfectly refined and skilfully used, it is equal to the best lard in all cooking operations. Cotton-seed cake or meal is also especially rich in nutritive matter for farm stock. Estimating the cotton-seed at 10 cts. per bushel, and oat straw and coarse hay at 10 dollars per ton, the average cost of food consumed per head per day of cows experimented upon during the past winter was 7.3 cts., cows averaging 1½ galls. of milk per day. One steer fed for beef, weighing 700 lbs., when shut up gained 260 lbs. live weight, or an average of 4½ lbs. per day, consuming an average of 14.4 lbs. of seed per day, and 11 lbs. of straw and hay; average cost of food per day not quite 10 cts. Other experiments pursued at the State Agricultural College of Mississippi showed that boiled cotton-seed with any kind of straw or hay would cause cattle to fatten rapidly, no matter how poor in condition. It also makes very rich milk, the oil of the seed seemingly appearing in the milk in the form of cream. The quality of the butter, however, when the cows are fed largely on cotton-seed, is poor. Other experiments with regard to food and manure are to be made.

GLEANINGS.

A Substitute for Hops. — Considerable commotion, says the British *Medical Journal*, has been raised in the beer-brewing and beer-drinking world by a letter published in a contemporary, written by a firm of drug-brokers in Mincing Lane, with reference to the substitution of drugs possessing bitter flavor and tonic qualities for hops. They state that, in consequence of the failure of this season's crop of English hops, calumba root, chamomiles, quassia, and cheretta have greatly advanced in price, thereby implying that these substances are likely to be largely employed in producing the flavor dear to the palate of the consumer of "bitter." The great firms of brewers have, in consequence, unanimously protested that they never use anything but hops to produce the bitter constituent of their beers, and therefore practically deny the inferences to be drawn from Messrs. Josephs' statistics. This, doubtless, is the fact; but if the case were otherwise, and the drugs named were used in the brewing of bitter beer, no possible injury, but rather benefit, would result to the beer-drinking public. Few old Indians, or any persons suffering from the possession of a "liver," but know the good effects of calumba; quassia is also one of the most efficient vegetable bitters known to pharmacists. The same may be said of cheretta and chamomiles. So that even if the hop crop were deficient, it is certain that the public health would not suffer, and drinkers of bitter beer would not detect any difference of flavor in their beverage.

Dutch Butter. — Holland has been for a long time the largest foreign customer of the American manufacturers of oleomargarine oil, which she has used to so good purpose in adulterating the butter which she sends to England that at present the words "Dutch butter" signify to Englishmen only the artificial product, and the reputation of the Holland dairy has been irreparably ruined. Chicago manufacturers of "butterine" and similar compounds are doing their level best to reduce the standing of the American dairy in the same way and to the same extent.

Virgil as a Veterinary Poet. — The *Journal of Comparative Medicine* endeavors to show that Virgil, as a poet, properly belongs to the veterinarians. He describes in the Georgics a number of diseases that affect cattle. In one place an ox is supposed to have died from anthrax: —

> "Ecce autem duro fumans sub vomere taurus
> Concidit, et mixtum spumis vomit ore cruorem
> Extremosque ciet gemitus, it tristis arator," etc.

Which Dryden translates as follows:

> "The bull, which to the yoke was bred to bow
> (Studious of tillage and the crooked plough),
> Falls down and dies; and dying, spews a flood
> Of foamy madness, mixed with clotted blood."

In the same connection Virgil describes most vividly the effects of an epidemic among horses. The clinical symptoms resemble those of glanders.

Gardening in London. — Prizes are given annually in the poorer districts of London for the most successful window gardening. A gentleman living in Baker Street, in that city, has carried the idea even further, and established a garden upon the roof of his house, in which he cultivates with entire success French beans, cucumbers, strawberries, etc., as well as flowers. Apparently the London smoke does not disagree with them.

Indigenous Potatoes. — Mr. John E. Lemmon, a member of the California Academy of Sciences, has made a very important discovery. He has recently returned from a botanical excursion of several months in the range of rugged mountains in Arizona, along the Mexican frontier. The discovery is that of two or three varieties of native indigenous potatoes, some of which were growing in mountain meadows, whose surrounding peaks were 10,000 feet above the level of the sea. The specimens were about as large as walnuts, and they were to be distributed among careful cultivators, who will experiment with them for a number of years, to see what can be made of them. The original home of the potato has long been a matter of dispute, but we now know where one home is to a certainty. It is among the probabilities that from these Arizona tubers will come a new and vigorous race of potatoes, to take the place of the short-lived varieties now grown. It is true we get occasional new and fine varieties from seed balls, but after all they are from the same old stock, the inheritance of disease and constitutional weakness, as is proved by the fact that all of them "run out" after a few years. They do not cease to appear in our markets because they are superseded by better varieties, but because they cease to be productive.

Destruction of Ants. — A correspondent of the *Tropical Agriculturist* says: Take a white china plate and spread a thin covering of common lard over it; place it on the floor or shelf infested by the troublesome insects, and you will be pleased with the result. Stirring them up every morning is all that is required to set the trap again.

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON FEBRUARY 1, 1883.

BURDENSOME INVENTIONS.

In any estimate of the public value of several recent inventions which have been received with great apparent favor, the important fact must not be lost sight of that these inventions are a burdensome tax upon the people, for which, in a majority of cases, no corresponding benefits are received.

The introduction of the telephone, or its use to a very large extent, is, in a true sense, *compulsory.* It is not introduced into counting-rooms, stores, and dwellings because it is needed or wanted, but because pride or competition influences the patron. In many instances where it has been introduced into dwellings, pride and curiosity combined have led to the act, — not any pressing want or necessity. It is learned by Mr. A. that his neighbor Mr. B., a wealthy man, perhaps, has had the "wires" brought to his house, and all the family are shouting to butchers and grocers through the little round hole in the polished box on the wall. Mr. A. and his good wife decide that they must have all the "facilities" for instantaneous communication that Mr. B. has, although their pecuniary resources are barely sufficient for the absolute needs of the family, and so the telephone man is sent for, and forthwith the A. family are shouting through the hole in the box as loudly and frequently as the B. family. This "great convenience" adds fifty dollars a year to the household expenses, a sum which cannot well be afforded.

The butchers, grocers, and market-men do not want the box; competition is so great they cannot well afford the expense, but the butcher or grocer over the way has thought to turn a penny by introducing it, and so others must follow, to keep up with neighbors and competitors. Of course, increased expense of doing business implies increased charges for foods and commodities, and so in the end the people, families, consumers, contribute directly and indirectly to the swollen stream of money which is flowing into the coffers of the happy owners of the great telephone monopoly. If only those who are really benefited by the telephone were its patrons, the value of the "patent" would not be greater than of those connected with most new "apple-parers," or washing-machines.

The electric light corresponds in its history, as related to its introduction and use. The people in towns and cities have light enough, *cheap* light, sufficient for all the wants of the highest civilization. Kerosene and gas at present prices are the cheapest and most convenient sources of artificial illumination known to science. If electrical energy is proved capable of supplying a cheaper and more desirable light, then it will become a positive benefit and blessing instead of being a burden upon the people, as it is at present. As regards household illumination no increase of light is needed; the same may be said of most streets and shops in towns and cities; but there are many other places where the elec-

trical light will prove of great service, and its increased cost can well be afforded. In large manufacturing establishments, in public gardens and parks, railroad stations and grounds, the light meets a real want, and must become a permanent fixture.

In all cases where the electric light is introduced into shops, hotels, houses, etc., to meet competition, its use is compulsory, and the cost becomes a burden directly and indirectly upon the people.

PROGRESS OF ELECTRICAL LIGHTING.

THERE is at the present time great activity among the rival electric lighting companies to bring to notice their various devices. To ordinary observation it would appear that the new method of lighting had passed the stage of experiment, and become firmly established as the successful rival of gas. This is not true, however, and it is a matter of doubt if it ever becomes true. A vast number of formidable difficulties have been overcome which stood in the way of practical success, but there remain others which are of no mean importance. The time is near when decisive action will be taken to prevent the placing of conducting wires above ground, and it appears at present as if the difficulties in the way of the success of buried wires were insurmountable. The enormous expense of the undertaking and the difficulties of insulation are among the obstacles of the greatest moment. Mr. Edison, in New York, has met with only partial success, and at the present time appears to be inactive. The cost of putting down his street conductors was excessive, and the true cost will probably not be known outside of interested parties.

The cost of electric lighting in all instances in this country greatly exceeds that of gas, and in England no better results have been reached. A most valuable and exhaustive report upon electric lighting has just been made by the gas committee of the Birmingham city council. In England all conductors in cities are required to be placed in the ground, and the committee state that the advantages gained by the experiment of distributing electricity will not compensate for the disadvantages which must follow the breaking up of the streets in the busiest parts of the city. The profit of electric lighting is a point fully discussed, and the committee quote Mr. Crompton's statement, in his evidence before the Parliamentary Committee on the Electric Lighting Bill, that no remunerative return was to be expected during the first seven years, at least, of the experiment, as well as a statement made by Mr. Gainsford, in a recent debate in the Sheffield Council, based upon experience gained in collieries with which he is connected, that electricity cannot be produced at the cost of gas, even when the motive power is provided free. Estimates of Dr. Siemens for a quarter of a square mile area, and of Mr. Crompton, Dr. Hopkinson, and Mr. Johnson for one square mile area, are given. Dr. Siemens allows 24,000 to 30,000 incandescent lamps in his area and 70 arc lamps, and estimates the cost at £100,000; the other authorities allow 50,000 incandescent lamps, and give the cost as £200,000. Nearly all the witnesses agreed that nothing but a large experiment from a common centre would properly determine the question of cost. In another part of the report, it is stated that the prime cost of the conductor from Messrs. Winfield's works to the Town Hall, about 500 yards in length, amounted to more than £800, or equal to £3000 a mile, without services. This sum appears tremendous, and until something is done to reduce the cost of this essential of electric lighting, progress will be retarded very greatly. The committee has made estimates for the supply of gas and of electricity for the Market Hall Ward, covering an area of 1000 yards square, and using at a moderate computation 120,000 lights. The cost of gas works, mains, and services for this consumption is stated as £170,000 as a maximum and £100,000 as a minimum. The cost of electric light plant for about 100,000 lights is given as £423,500. The cost of meters is left out in both statements, as it is not known that a practical electric meter has been devised. The report concludes with a number of practical suggestions, the main drift of which is that it is not advisable for the local authority to apply for powers of supply, but that the committee be authorized to enter on negotiations with the companies applying for such powers.

These careful estimates and conclusions arrived at by competent men should lead the authorities of our cities to hesitate before incurring great expense in the introduction of electric lighting.

The best form of incandescent lighting is that of Swan, of England. It has unquestionable advantages over that of Edison, or any other inventor in this country. The Brush arc light is the best of that form yet introduced.

The least of all objections to electric lighting is that of danger from the conductors. It is a difficulty which can be easily met, and will be when the companies are compelled by law to place their conductors in the ground. This is a measure which should be speedily adopted by every legislature in the country.

REMOVING CLINKERS FROM STOVE LININGS.

A CORRESPONDENT in this city sends us the following note:—

Once in a while we see in the papers directions for removing clinkers from the linings of stoves. Prevention being better than cure, I propose to shew how they can be prevented. Three years ago I put a new lining in a No. 3 Magee Heater, and no one would imagine, from examining it to-day, that it had been used more than a week. With a piece of iron about half an inch wide, bent to reach the whole lining, I scrape the surface of the lining, shake down lightly, and then put on coal. Kindlings will be required if the fire has been left to get too low, but it is better to do this earlier, as it keeps a steadier fire, and takes no more coal. I think I can explain it on correct principles. When the fire is the hottest there are no ashes; but as the heat has decreased the ashes have formed and settled down against the lining, and shaking does not wholly remove them. If more coal is added the heat is sufficient to fuse the ashes on to the lining, and there it stays. Each time this is repeated more ashes adhere, and it does not take long to spoil a lining. I scrape these ashes off thoroughly the first thing, and none adhere, and it seems that the lining will never wear out.

There is another thing to be noticed. If one stirs a coal fire at the top, in the centre, the fire generally goes out, because the cold air goes up through the centre; but by scraping around the outside of the fire, and leaving the centre undisturbed, the air going up around the fire slightly cools off the lining, and the coal in the centre retains its heat sufficient to burn up again quickly without kindlings, if the replenishing has not been too long delayed. The grate must be let down often enough to prevent the accumulation of clinkers in the bottom. Once or twice a week I let down my grate, replace it, and put in some wood, then some of the live coals on the top, when it burns up immediately. I then put on a hodful of coal and close the stove, and have a fire at once without the heat having gone down, and so keep a good fire all winter. This can be depended on: that scraping the ashes from the lining before replenishing a fire — *every time* — will effectually prevent clinkers from adhering.

METEOROLOGY FOR DECEMBER, WITH A REVIEW OF THE YEAR, 1882, IN PART.

THE sum of my observations on the weather for the past month has been as follows: —

Average Thermometer.		Lowest.	Highest.	Range
At 7 A. M.	21.61°	2°	52°	50°
At 2 P. M.	31.94°	20°	45°	25°
At 9 P. M.	25.00°	9°	38°	29°
Whole month	26.18°	2°	52°	50°
Second average[1]	25.88°	2°	52°	50°
Last 19 Decembers	26.27°	17.15° in 1867	36.04° in 1881.	18.89°
Second average[1]	25.93°	16.34°	35.84°	19.50°

[1] Found by adding the average evenings *twice*.

The average barometer for the month was 29.958 inches; the lowest, 29.50, on the 13th, and the highest, 30.30, on the 20th, a range of .80 of an inch. The average for the last 10 Decembers has been 29.942; the lowest, 29.804, in 1876, and the highest, 30.073, in 1879, a range of .269 of an inch. The sum of the daily variations was 6.50 inches, giving an average daily movement of .210 of an inch. The average for the last 10 Decembers has been .255, with extremes of .190 and .327, in 1880 and 1879. The amount of rain in those years was 2.87 and 5.57 inches, an approximate correspondence with the barometrical changes. The largest daily movements were on the 6th and 13th, being .67 and .72 of an inch, attended with snow and rainfall, one and one fifth inches of the latter.

The face of the sky in 93 observations gave 47 fair, 21 cloudy, 16 overcast, 3 rainy, and 6 snowy. The amount of rainfall, including eight inches of melted snow, was 2.74 inches, while the average amount for the past 14 Decembers has been 3.49 inches; the lowest, .73, in 1875, and the highest, 5.93, in 1881.

The direction of the wind in 93 observations gave an excess of 16 northerly and 76 westerly over the southerly and easterly, indicating the prevailing direction for the month to be west 11° 55′ north, or W. by N. The average for the past 14 Decembers has been west 18° 35′ north. The westerly winds have uniformly prevailed over the easterly by an average of 54.29 observations, while the northerly have prevailed over the southerly, with two exceptions, 1874 and 1881, by an average of 18.21 observations.

The sleighing on the last day of November continued December 1st, but was spoiled by a warm day. On the 11th, 6 or 7 inches of snow restored it for a full third of the month. The temperature was a near average for December, while the barometer and rainfall were below, and the average wind more nearly west, by a full half point. The extremes of temperature occurred on the mornings of the 4th and 6th, a thing quite unusual, not only in being so near to each other, but especially, that the warmest observation of the month should occur in

the *morning*, an hour in December usually the coldest.

The following table exhibits the variations of temperature for the year 1882, in comparison with those of the past 19 years, both daily and monthly.

	1.	2.	3.	4.	5.	6.	7.	8.	9.
	Daily and monthly in 1882.				Monthly and daily the past 19 years.				
Month.	Min.	Max.	Range.	Mean.	Mean.	Mo. & D. Min.	Mo. & D. Max.	Monthly Range.	Daily Range.
January	-15	46	61	24.62	22.80	12.46 -22	32.98 66	20.58	88
Feb'y...	-3	50	53	28.45	24.63	13.98 -20	31.38 60	17.40	80
March ..	16	56	40	34.90	31.81	22.61 -18	39.18 70	16.57	88
April...	22	67	45	43.35	43.88	38.17 19	50.61 79	12.44	67
May....	36	79	43	51.34	56.11	50.72 29	64.28 91	13.56	62
June....	53	90	37	67.22	66.44	61.57 41	70.43 94	8.81	53
July....	56	90	34	71.92	70.77	65.64 51	73.47 95	7.83	44
August.	53	89	36	70.01	68.41	63.79 42	71.76 96	8.97	54
Sept....	43	84	39	63.74	60.53	54.90 32	66.69 87	11.79	55
October	34	75	41	54.03	49.04	40.60 18	56.16 84	15.56	70
Nov.....	15	67	52	36.09	36.38	31.12 -2	42.57 75	11.41	77
Dec.....	2	52	50	26.18	26.27	17.15 -18	36.04 65	18.84	83
	36.17	70.42	44.25	47.65	46.42	39.32 11.75	52.96 80.17	13.65	68.42

The above table scarcely needs explanation, but will bear careful study. It is so arranged as to make comparison easy. The first four columns relate to the past year; the remaining five to the past 19 years. Columns 4 and 5 exhibit the means of the past year, month by month, as compared with those of the past nineteen, and the footings of these columns show that the temperature of the past year has been nearly one degree and a quarter warmer than the average. Columns 6 and 7 give the monthly extremes for 19 years, and beneath these numbers the daily extremes of the same period. Column 8 gives the monthly range, and column 9 the daily. The footings below give the average or mean for each point of comparison. The footings of columns 6 and 7, however, do not give the actual temperature of any one year, but what such a year would have been had all the coldest or all the warmest months of the 19 years occurred in one. In either case, such an event would prove highly injurious to the vegetable kingdom, if not to the animal, including man. But a kind Providence usually mingles great clemency with some severity — lessons of discipline still needed by the human family.

D. W.

NATICK, *January* 8, 1883.

EDITORIAL NOTES.

THE MASSACHUSETTS HORTICULTURAL SOCIETY. — This society is holding a series of interesting meetings at Boston. Its programme for the season calls for weekly meetings running to the end of March. Five of these have been held, and the following are yet to come: February 3, an Address from Dr. James R. Nichols; February 10, a discussion on "Herbaceous Perennials;" February 17, "New and Useful Shrubs and the Best Method of Propagating;" February 24, "Cultivation of Hardy Grapes;" March 3, "Strawberries and their Culture;" March 10, "Hybrid Perpetual Roses;" March 17, "Culture of Currants, Raspberries, Gooseberries, and Blackberries;" March 24, "Preparing and Fertilizing the Soil for the Growth of Plants;" March 31, "Sports Physiologically Considered." Marshall P. Wilder, the veteran horticulturist, is still an active participant in the society's meetings, which draw together in considerable numbers the most successful gardeners, florists, and fruit-growers of the Boston suburbs. The doings of the society are attractively printed from week to week in leaflet form.

FORESTS AND STREAMS. — The *Journal of Forestry* for December, 1882, states that a French writer tells of two exactly similar pieces of land, one cleared and the other wooded, where the wooded piece yielded ten times as much water as the open. The open piece had a very irregular flow, while the woodland yielded an even, regular supply. Another fact is given relating to America. A stream which for years and years, without failing, had supplied several mills with power finally gave out. It not only failed to fill the ponds, but it actually dried up. An investigation showed that the woods through which its course flowed had been cut down. Subsequently, these woods were allowed to grow up again, and for the past ten years, in spite of droughts and other troubles, the stream has flowed without any interruption.

A CURIOUS CASE OF "MIXING LIQUORS." — A foreign exchange tells this curious story: A traveller in British Guiana, in accordance with custom, took a draught from the stem of one of the water-holding plants which thrive in forests. Not being a blue ribbonite, he was afraid of the sudden chill which the non-intoxicating beverage might create, and forthwith took a "nip" of rum for his stomach's sake. Unfortunately, the liquid he had been imbibing was sap, which has the peculiarity of coagulating and hardening in alcohol. The rum performed its part, and the poor fellow's internal organs became literally sealed up with india rubber, the result being that he died. It may be said that if he had been a teetotaler he would not have been killed in such a novel manner; but neither would he had he been content to drink his rum undiluted.

THE MUD-BATHS OF EUROPE. — A correspondent of the *Cincinnati Lancet and Clinic* says: "Here in Austria they excavate a marsh where decaying vegetable mould and water is in abundance, cart it to the bath-houses, grind it in a mill, and pass it into a large tank, where it is mixed with water and heated by steam. From the tank it is drawn off into portable bath tubs, where it is again mixed, more water added, and the temperature brought to the desired grade. Then it is wheeled into the bath-room, and the unfortunate bather plunges into a black, bad-smelling mixture, where he remains from twenty minutes to half an hour, when he steps into a second tub, full of pure water, to cleanse himself. The mud is too precious to be wasted, so after being used it is deposited in a great heap, where it is said to remain ten years before it will be fit for use a second time. These heaps remind one in more ways than one of those which the dairy farmer accumulates behind his cow stable. The mud-bath is popularly believed to be very beneficial in all cases, — a veritable cure-all. The physicians questioned on the subject were unwilling to commit themselves as to its indications and effects, except in the case of hypochondriacs, with one exception, and he said where a poultice for the whole body was necessary he knew of no more convenient method of applying it."

WOMEN DOCTORS IN SPAIN. — *La Tribuna*, of Madrid, has a long account of the granting by the medical faculty of that city of a degree of medicine on Señorita Martina Cascllls y Bellaspi. She is the first Spanish woman who has ever studied medicine and taken her degree. The paper speaks in warm terms of her as a lady who, in spite of much opposition and national prejudice, has won high honors. Another Spanish lady is following in Señorita Casells' footsteps. Finding the Valencian School of Medicine had closed its doors against her, she is now studying in Madrid, where she has met with a more friendly reception.

AN Antarctic expedition to Cape Horn is being fitted out by the French government. It will be furnished for eighteen months.

ATOMS.

CHIARI, the Pathologist, who has just been made professor at Prague, is a man thirty years old, who has already made over 8000 post-mortem examinations. At a recent supper given in his honor, one of the speakers said he could not wish for greater happiness than that of being post-mortemed — if one may use the expression — by his friend Chiari.

AN old lady who lives in Massachusetts heard that Mr. John Bright was going to visit this country. "Well," said she, "I hope he won't bring his disease with him."

To deodorize rubber articles, cover them with charcoal dust; place them in an enclosed vessel, and raise the temperature to 94° F.; let it remain thus for several hours; remove and clean the articles from the charcoal dust, and they will be found free from all odor.

FLEXIBLE paint for canvas may be made as follows: yellow soap 2½ pounds, boiling water 1½ gallons; dissolve; grind the solution while hot with 125 pounds good oil paint.

THE *Commercial Bulletin* says: "Bell telephone is down to 174 and thereabouts. While the business is extending at one end, there are many at the other who are dropping the instrument, not only because the charges are believed by many to be too heavy, but also because of the bungling way in which much of the work is done."

CRURAL neuralgia is said to be somewhat frequent among dentists, owing to the position they have to assume during their work.

TWO New York neurologists were recently seen to shake hands with each other in a cordial manner. It is thought now that it will not be necessary to organize a third neurological society.

A "CLASSICAL student" says, "You ask, 'If Atlas supported the world, what supported Atlas?' The question, dear sir, has often been asked, but never, so far as we are aware, satisfactorily answered. We have always been of the opinion that Atlas must have married a rich wife, and got his support from her father."

MARK TWAIN says there is something very fascinating about science, — it gives you such wholesale returns of conjecture for such trifling investments of fact.

A BUSY doctor sent in a certificate of death the other day, and accidentally signed his name in the space for "Cause of death." The registrar says he wishes the profession would be as accurate generally.

COCKROACHES, says a correspondent of *Land and Water*, who has lived with them in all the "five quarters" of the globe, will not touch bookbinding varnished with a mixture of one part copal varnish and two parts oil of turpentine. With a large brush paint this over the cloth binding and let the book stand to dry. Unfortunately it cannot be applied to the edges.

A MEDICAL student at Bowdoin College once asked the late Professor Parker Cleaveland if there were not some more recent works on anatomy than those in the college library. "Young man," said the Professor, "there have been very few new bones added to the human body during the last ten years."

MR. MARWOOD, the London hangman, being asked by a neighbor what was a good remedy for a troublesome cough, is reported to have replied that his "Marwood's Drops" had never yet been known to fail.

MR. EDWARD ATKINSON, illustrating the advantage of machinery, says it would require sixteen million persons, using the spinning-wheel and hand-loom of less than a century ago, to make the cotton cloth used by our people, which is now manufactured by one hundred and sixty thousand.

Medicine and Pharmacy.

CARBOLIC ACID AND THE CARBOLATES.

THE following *résumé* of the properties and effects (physiological and otherwise) of carbolic acid and its compounds, according to the most recent works on the subject, appeared in the *Progrès Medical*: —

Crystallized carbolic acid is soluble in fifty parts of water, when chemically pure in twenty parts (Binz, Hager), and in every proportion in alcohol, ether, chloroform, sulphide of carbon, glycerine.

Absorption is rapid, even through the skin when intact. Elimination is rapid, by the skin, lungs, and kidneys.

In the urine, when the acid has been introduced in small quantities, a phenol sulphate, non-toxic, is found; when the doses have been large, another phenol compound is found (Baumann). The urine is very often of an olive-green or greenish gray color, particularly when the acid has been absorbed through the skin, or through a wound. In some cases, but rarely, albumen has been found.

Principal physiological effects: In the dose of from five to seven grains it has no toxic effect. In larger doses, up to thirty grains, it induces excitation, stupefaction, vertigo, ringing in the ears, feebleness, diminution in frequency of the pulse, fall of temperature, colic, and diarrhœa. In toxic doses it causes vertigo, delirium, stupor, anæsthesia, analgesia, intermittence and final arrest of heart in diastole; very rarely convulsions, collapse, coma, and death.

Counter-poisons: Sucrate of lime (Huseman), sulphate of soda and the other sulphates (Baumann), inhalations of oxygen, bleeding, transfusion (Ferrano).

The local effect produced by weak solutions is a sensation of burning, which disappears in the course of half an hour. This is the effect produced by hypodermic injection of Hueter's solution, which contains two per cent. of the pure acid; it gives rise also to ecchymosis of limited extent, but without the formation of an abscess. Hueter employs it in hypodermic injection, to prevent the spread of erysipelatous inflammations to the adjoining skin; five or six injections, of 20 drops each, are made in the skin, just around the part affected, and are repeated a second time the same day; very often the spread of the inflammation is arrested.

Hypodermic injections of carbolic acid have been employed in intermittent fever, by Jessier, Declat, Hueter, Hirschberg; in prurigo, by Rezek and Fleischmann; in diphtheria, by Frotz; in phthisis, by Schnitzler; in crural neuralgia and pleuro-pneumonia, by Hayem and Kunze; in typhoid fever, by Declat; in malignant pustule, charbon, by Raimbert and Meplain (solution, 1 in 50); in nævus, by Badley; in acute articular rheumatism, by Senator, Kunze, and Golbaum.

Apropos of this subject, our friend who has several times sent us communications on his experience with carbolic acid, says in a recent note: —

I have had continued success with carbolic acid, particularly in lung troubles, and have had no failures. Of course you have seen how much it has been used in England and elsewhere, and I think there has been nothing to show that I have been in error in my views. My position is strengthened by the fact, now pretty surely established, that consumption is contagious on account of a micro-organism, and that phthisis is supposed to be infectious on account of bacilli. In April, 1881, you published an article in the JOURNAL on "Carbolic Acid for Colds and Coughs," the last sentence of which ran thus: "Inhaled, the acid acts as an anæsthetic and as a destroyer of microscopic organisms, and it is easy to see how it benefits a cough." I came to that conclusion from my own observations, and I think I have a right to feel elated to find that scientific men have decided that such is the fact.

I have used the acid in diarrhœa with uniform success, even on children as young as three months. Dr. Eade, of England, said it ought to be beneficial in bowel complaints, but I do not read that any one is using it for that purpose.

There is one other trouble for which pure carbolic acid does better than anything I know of, namely, ingrowing nails. The melted acid runs in between the nail and the irritated flesh, and allays the irritation. In every case where I have used it the pain ceased at once, and the recovery was immediate.

While on the subject, we may add the following impromptu "Ode to Carbolic Acid," by a correspondent of the *Lancet*, on reading a telegram that the wounded in Egypt were treated antiseptically: —

Now war is o'er, and times are placid,
We 'll sing of thee, carbolic acid!
Thou art the friend I would repair to
For many ills that flesh is heir to.

Our fathers knew thee not, but tried
Their remedies with guesses wide:
None approached to thee at all; some
Used, however, Friar's balsam.

I proved thee first in '67.
The wounded bless'd thee as from Heaven;
They lauded thee in grateful terms,
Yet knew no theory of germs.

Should dreaded fever now appear,
And friends avoid the place with fear,
With thee we 'll dire contagion meet,
Confining it with sprinkled sheet.

Against pyæmia, putrescent fever,
We hold in thee a mighty lever;
For sarcinæ and ailments peptic,
All hail to thee, great antiseptic!

PRACTICAL HINTS FOR THE STUDY OF THE BACILLUS OF TUBERCLE.

MR. A. C. MALLEY, in the *English Mechanic*, in response to the request of a correspondent for minute and specific directions as to the obtaining and examining of the bacillus of tubercle, now attracting so much attention in medical and scientific circles, gives the following useful hints, which will be acceptable to certain of our friends who have expressed a desire for similar information: —

The *Bacillus tuberculosis* is found in greatest abundance in the cheesy portions of phthisical sputa; in fact, in portions of expectorated tubercle, especially the non-reticulated form. Koch and Ehrlich have successfully demonstrated its existence by staining the organism and surrounding substance different colors; but as the results obtained by their methods are not always successful, and even when so are decidedly inferior to that recommended by Dr. Heneage Gibbes, I will confine myself to the solutions recommended by him, and his method of using them, while the plan I have myself adopted for mounting after staining will alone be given.

No. 1.

Magenta crystals	2 grams.
Pure aniline	3 "
Alcohol, sp. gr. 830	20 "
Distilled water	20 "

Mix the aniline and spirit, reduce the magenta to a fine powder, add the spirit slowly while stirring till all the magenta is dissolved; add the distilled water in the same way, and place in a stoppered bottle without filtering.

No. 2.

Acid nitric, strong	1 part.
Distilled water	2 parts

No. 3.

Saturated alcoholic solution of methyline blue	1 part.
Distilled water	4 parts

The chemicals must be the purest obtainable, and distilled water alone used in their preparation and the subsequent washing. They can all be obtained ready made from leading chemists.

The sputa, if possible containing some of the cheesy portions already mentioned, are placed on a glass plate and mixed with a small ivory spatula. A very minute portion is taken up with a clean camel's-hair brush, and evenly painted over a cover-glass, care being taken not to go over the same place twice. The cover-glass is placed aside to dry in air. It will be found more convenient to prepare several cover-glasses in this way before proceeding with the following manipulations.

The cover-glasses, when dry, are passed three or four times rapidly through the flame of a spirit-lamp; this fixes the sputa, and they may be placed aside for an indefinite period before staining.

The cover-glass, sputum downwards, is floated on solution No. 1 for 20 minutes (the solution during the time being kept at a temperature of about 104° Fahr.), and then placed on solution No. 2 for 10 or 12 minutes; this latter operation removes the stain from everything except the tubercle bacillus.

The cover-glass is next washed in distilled water, with frequent changes, for half an hour; floated on solution No. 3 for one hour, at the ordinary temperature; again washed in distilled water, and (the excess of water being previously removed with blotting-paper) placed aside to dry. When dry, the cover-glass is again passed through the spirit-lamp, and on cooling mounted on a thin glass slip, without the addition of any medium.

The best way to fasten the cover-glass to the slip is to pass a brush charged with some thick cement round its edge before placing it on the slip.

By this method, the tubercle bacillus may be detected with a good 1 inch, while any ordinary dry quarter will show it distinctly as a small red worm on a blue ground.

Sections of lung may be treated in the same manner, and mounted in —

Glycerine	1 part.
Solution of gum	5 parts.

The solution of gum should be of the same consistency as the glycerine, and a lump of camphor should be placed in the bottle in which it is kept. I do not recommend chrysoidine for a second stain, as it renders photography impossible.

These organisms measure from .008 to .011 of an inch in length. The observer should be extremely careful not to mistake the colored bands produced by minute markings and an inferior object-glass for *B. tuberculosis*.

If the sputum is not fresh, almost the entire blue ground will be found to consist of *B. termo*, spirilla, torulæ, etc., while *B. tuberculosis* is alone stained with magenta.

It was recently asserted by Dr. H. D. Schmidt, of New Orleans, that he had ascertained beyond a doubt that the supposed tubercle bacilli were nothing but fat crystals; but this is disputed by Dr. J. O. Hirschfelder, of the Cooper Medical College, San Francisco, who writes to the *New York Medical Record* as follows: —

In the *Record* I find a statement of investigations of Dr. H. D. Schmidt, of New Orleans, proving the bacillus tuberculosis of Koch to be simply a fat crystal. If this assertion were true, it would cast a shadow of doubt upon all the bacteriological work done within the past few years. I have confirmed the investigations of Koch upon the sputa of a large

number of cases under my charge, finding the bacillus in every case of phthisis in my wards during the last three months, besides many in private practice. I have employed Ehrlich's method, and have experienced no difficulty in demonstrating the organism. In order to test the statement of Dr. Schmidt, I first prepared a specimen of sputum by Ehrlich's method, finding numerous bacilli. I then placed the preparation in ether, and again examined it; no bacilli were visible. The natural inference was not that the bacilli were dissolved, but that the color was washed out by the ether. The preparation was therefore restained, like a fresh specimen, and the bacilli were found as before. I likewise prepared two covers by spreading sputum upon one of them, breaking it up as well as possible, placing a second thin cover upon the first, and drawing the two rapidly apart, so that the covers should be as nearly alike as possible. One cover was then stained in the ordinary way; the other was placed in boiling ether, in which it remained for about twenty minutes, and was then washed thoroughly with fresh ether, so that no fat should remain. This specimen was then stained by Ehrlich's method, and the two covers were compared. I found and readily demonstrated to the medical gentlemen present not only that the bacilli were not dissolved by the ether, but that, on the contrary, they stood out more plainly in the specimens treated with ether on account of the washing out of the fat granules, which otherwise slightly obscure the field.

INSOMNIA AND INSANITY.

The following is an extract from a work by Dr. C. E. Page (portions of which have appeared as communications to the JOURNAL) on "The Natural Cure of Consumption, Dyspepsia," etc., now in press, and soon to be published in New York: —

Sleeplessness is often referred to as a cause of insanity, but it would be much nearer the truth to say that insanity causes sleeplessness. Dr. Rush says: "A dream is a transient paroxysm of delirium, and delirium a perpetual dream." Not every dreamer becomes insane, in the common understanding of the term, nor every person who is distressed by wakefulness; nor do all those persons who dream dreams of a strange, droll, startling, heart-rending, exhausting character become inmates of lunatic asylums, although all such are fit subjects for a rigid hygiene; and not a few out of this large number of bad dreamers — who are likewise afflicted with insomnia — but could with advantage place themselves under the charge of an expert in diseases of the brain, or even in an asylum, if either the former, or the physicians in charge of the latter, were in all regards thoroughly equipped for their work, — a rare circumstance indeed. Normal sleep is dreamless; in default of this total oblivion, sleep is only partial, — it is not perfect nervous repose. No person who suffers severely from indigestion but is also troubled with much dreaming, and, more or less, with wakefulness; and no person who has these last-named symptoms but can safely set them down, at least in great measure, to digestive disorder, and as, almost invariably, removable by improved habits.

Some very wise men have stated as their belief that no man living is really of sound mind, any more than of sound body, in the strictest application of the term; all have their crazy aspects, — their "weak spots," as we say; and the anxious, brooding man, who fears the loss of his reason, may take courage from the thought that his symptoms are only a little worse than his neighbor's, and only demand of him to diminish his dyspepsia, if he would become normally insane! To attack insomnia as a disease instead of a symptom is sure to result in discomfiture in the great majority of cases, and is in every instance unsound in principle. Once established, this condition of wakefulness tends to perpetuate itself; but this would be otherwise with an absolutely natural regimen. A man is wakeful at night because under his present physical condition he ought to be, — just as in diarrhœa the looseness is doing its work of cure. So with all symptoms. *Pain* has its office, and this is coming to be better understood; is already well known to thoughtful, well-informed people; and the *wakefulness* of which so many complain, and which, in some cases, is of the most distressing, painful character, is as truly normal, considering the present physical state of the sufferer's brain, as is pain following a cut. As an aid in the removal of this symptom, next to a radical reform in one's living habits, which is the only possible cure for the disease, the above reasoning is one of the most effectual.

When a man is wounded severely his anxiety is not increased by the pain; it causes no additional alarm, because he knows that it is entirely natural; let him know that sleeplessness is but an analogue of pain, — a symptom, not the disease itself, — and he will, or may, bear it philosophically, and thus tend to its removal. He has a poverty-stricken mind, indeed, who cannot, under such circumstances, pass an hour, or several of them, in comparative comfort, knowing that sleep will come in good time. But, thinking all the while that it is sleep only that he needs, his sleeplessness distresses him, causes him to be more and more alarmed, and, consequently, has the effect to postpone the oblivion so devoutedly prayed for, but so little earned. To *deserve* sleep is to *have* it. Let the insomniac review the hints on diet, air, exercise, etc., so as to know what he has to do to become a *good man*, physiologically; let him go to bed at about the same hour every night, if possible, or at any rate when he does lie down to sleep it should be after a quiet hour or half hour devoted to peaceful and thought-steadying occupations, never exciting mental exercise, whether amusing or instructive; and when he draws the blankets about him, let it be with a sublime indifference as to whether he shall or shall not go to sleep promptly. "As to the subduing of the senses, the attempt to shut out external impressions by deafening the ears, closing the eyes, and lowering the sensibilities generally, is in itself a frequently recognizable and always possible cause of persistent wakefulness. The effort to compose the mind (after lying down) and subdue the activity of the senses is made by the higher mental faculty, a part or function of the organism which, of all others, needs to be itself restful in order that the physico-mental being may sleep. It is therefore obvious that an *endeavor* to go to sleep is a mistake."

To attempt to shut out the sense of sight by closing the eyes is always to render the inner mental sense increasingly acute. "The field of sight is soon crowded with grotesque and rapidly changing images, — a phantasmagoria, the worrying effect of which is only a too familiar experience of the sleep waiter," — and all the mental senses are in like manner stimulated, and their acuteness intensified, by the endeavor to lower the sensibility of the sense organs; and, worst of all, to narcotize them with drugs or sleeping-draughts is irrational and its effects injurious, and if long continued fatal. Rather, having ears to hear, let me hear, and eyes to see, see, and a brain, let me think. Let the brain, the ears, and the eyes "forget their cunning" only when the eyelids droop in sleep because I am sleepy. Meantime, not self-abasingly, but calmly and dispassionately, would I philosophize thus: Well, I am in for it again! I would like to sleep promptly, soundly, and long; why do I not? I suspect that I am not running this physico-mental machine even in a fairly physiological manner. I cause it to run at an abnormal rate during the day, and keep up intense mental excitement through stimulation of one sort or another, prolonging excessive mental activity too far on toward the night; and because of this, and the lack of a fair degree of muscular exercise, I only half breathe; of my fifteen or sixteen inspirations per minute, not one distends the air cells of my lungs to half their capacity. Thus the organism suffers in two ways, namely (1) the circulation is not sufficiently oxygenated for its general purposes; and (2) the waste matters are not "pumped out" of the substance of the brain[1] as effectually as need be. My coffee was strong and nice this morning; it stimulated me very satisfactorily throughout the day; and, what I had not bargained for, I am still feeling the spur. [See article on Coffee in JOURNAL for May and June, 1882.] That new brand of cigars is exquisitely flavored; but, upon the whole, a perfect night's sleep would be far more exquisite; at least, just now I am in the mood to think so. I sneered at that food reformer who told me he was never a good sleeper until his present simple, natural habits made him so; but now, just at this moment, it seems as if it would be a good trade to exchange some of my favorite dishes for coarse food and balmy sleep! . . . And so I would con over and look through myself and my habits, feeling sure that my eyelids would droop, and sleep would come before I should have completed the work of reform; and I am sure that every sufferer will find that a real reform, a permanent reform, will unfailingly lead on to *health*, and so to sweet and satisfactory sleep.

MISCELLANEA.

ARTIFICIAL INCUBATION FOR INFANTS. — Dr. Tavernier, physician to a foundling hospital at Paris, has tried an experiment with a view to lessen the enormous mortality among the infants under his care. A prematurely-born infant of miserable physique was made the subject of the experiment. It was placed in an incubator, made on the model of the artificial incubators for chickens. It was a box covered with a glass slide, furnished with a soft woollen bed, and kept at a temperature of 86° by suitable means. The child was placed in this and left in the dark with a nursing-bottle. On the second day it ceased to cry and sank into a deep sleep, which continued during the 60 days it remained in the incubator, the only wakeful intervals being when it was taking nourishment. At the end of the time it was as well grown and strong as a child a year old. Another experiment was tried, and was equally successful. The system was thus applied with all convenient speed to the 360 infants in the hospital. Their average weight was then 16 lbs.; average age, eight months, three days. Only one died from congenital hydrocephalus, another was reclaimed. The rest remained in the incubator for six months. The average weight was then 24 lbs. An ordinary observer would have said that the youngest was at least three years old. All learned to walk within a week after leaving the incubator, and most have since learned to talk.

JOHN HUNTER. — Dr. Oliver Wendell Holmes pays the following tribute to John Hunter: "A great comparative anatomist, a great physiologist, the cre-

[1] "As stimulation of the brain causes dilatation of its vessels, and increases the flow of blood through them, mental action of itself not only attracts more blood to the brain, but provides to some extent for the removal of waste products. Hence sleeplessness is normal for a clogged brain. The movements induced by the cardiac pulsations are not so extensive as those caused by the respiratory movements or by muscular exertion, and therefore, when the brain is overworked and the respiratory and muscular movements are restricted, the cerebral nutrition will be diminished by the imperfect removal of waste from its substance. But if, in addition to this, the cerebral cells and fibres are actually poisoned by the circulation within the vessels which supply them of noxious substances, due to imperfect digestion or assimilation, matters will become very much worse." — T. L. BRUNTON, M. D., F. R. S.

ator of a vast museum, the author of innumerable original observations of interest to medical science, a surgeon of distinction, a man of powerful native genius, insatiable in thirst for knowledge, indefatigable in accumulating it, his works have been treated as quarries by those who came after him, as the Coliseum was used to build up palaces for the Roman nobles of later ages."

THE COST OF FUNERALS. — The *New York Medical Record* says: It is claimed by one writer that one and one fourth more money is expended annually in funerals in the United States than the government expends for public school purposes, and that funerals cost annually more money than the combined gold and silver yield of the country in the year 1880. This does not include the cost of cemetery lots and burial fees. While it is quite natural to properly reverence the dead, it is certainly unnecessary to make extravagant expenditures in their behalf. Many poor families cripple themselves for months in order to make a last show of respect for the departed. The carriages, flowers, and music could be used to much better advantage when the poor body was animated and could really appreciate such luxuries.

THE AUTHOR OF THE ZYMOTIC THEORY OF DISEASE. — In Sir John Pringle's work on "Diseases of the Army," which is now about one hundred and forty years old, the idea was most distinctly enunciated that disease-germs of certain classes of disease introduced themselves into the blood, and produced a fermentation of the blood, which was the cause of a particular type of disease. Sir John Pringle gave further the results of some observations which showed that he believed in the convertibility of certain forms of zymotic disease to other forms, — diseases which physicians were accustomed to regard as of a different type.

HOT WATER IN NAUSEA AND VOMITING. — Dr. Morton says, in the *Louisville Medical News*, that several years ago he learned from his own personal experience that no agent relieves nausea and vomiting so satisfactorily and promptly as water, as hot as can be drank. Since then he has used it in a large number of cases, and no remedy that he ever administered in any condition has proved more uniformly reliable. He has preserved records of many of these cases, and makes the following classification: (1) cases in which nausea and vomiting occurred at the onset or during the course of acute febrile disease; (2) cases in which these symptoms were caused by overloading the stomach when its functions had been impaired by protracted disease; (3) cases in which they were produced by nauseous medicines (not emetics) at the time they were taken; (4) cases of acute gastritis caused by the indigestion of irritants; (5) cases in which these symptoms were purely reflex; (6) cases of chronic gastritis; (7) cases of colic in newly born infants; (8) cases of flatulent distention of the stomach in adults.

REMOVAL OF WARTS. — Dr. Unna, of Hamburg, had a young girl under his charge, whose dorsal surfaces of both hands were the seat of over a hundred warts, daily more making their appearance. He made on gauze tissue a plaster mass, which contained 10.0 grm. arsenic, and 5.0 grm. of mercury. This was kept on during day and night. Two weeks later all warts had disappeared, and the healthy skin was seen. The cure here is not established by necrosis and dropping off of the excrescences, but, like nature's spontaneous cure, by resorption.

A ROYAL SURGEON. — If only we could all treat our patients as the Prince of Wales did! Recently, when out shooting, one of the servants was slightly injured by a chance shot, and howled a little. The prince came up and said, "My friend, I am a doctor." He gave the wounded man a drink from his flask, and slipped a sovereign into his hand. The man got well without antiseptic precautions.

SELECT FORMULÆ.

HAARLEM OIL. — The following formula for the preparation of Haarlem oil is published by the Dutch Society for the Advancement of Pharmacy: —

Sulphurated linseed oil	1 part.
Rectified oil of turpentine	2 parts.

Mix and filter. The product is a bright, red-brown, oily liquid.

The same society gives the following directions for making the sulphurated linseed oil (*Oleum Lini Sulphuratum*): —

Linseed oil	1 part.
Washed sulphur	2 parts.

Mix and heat them together in a porcelain capsule at a temperature between 248° and 266° Fahr., under constant stirring, until the sulphur dissolves. It produces a dark-brown liquid, having a yellow color in thin layers, and is completely soluble in oil of turpentine.

BORACIC ACID POMADE. — Champonnière, in *La France Médicale*, gives the following formula: —

℞ Acid boracic.	gr. vi.
Vaseline	gr. xxx.

The acid to be very finely powdered, and directly incorporated with the vaseline. To this may be added the balsam of Peru ♏ viij. (gr. 50), to give it an agreeable odor. The ointment being antiseptic and non-irritating, it may be used for excoriations, superficial wounds, eczema, intertrigo, and especially the erythema of the buttocks of infants. In fetid perspiration of the feet this pomade may be applied, after bathing, with excellent effect.

HUCHARD'S ANTI-ASTHMATIC MIXTURE. — Dr. Huchard, of the Hôpital Tenon, employs the following, especially when the symptoms of bronchial catarrh are added to the attacks of asthma: —

Distilled water	10 ounces.
Iodide of potassium	2½ drachms.
Tincture of lobelia	2½ "
Tinct. polygala	2½ "
Aqueous extract of opium.	1½ grains.

A tablespoonful to be taken night and morning.

FOR ASTHMA. — The following is Dr. Fother gill's formula: —

Tinct. lobeliæ	5 ounces.
Ammonii iodidi	2 drachms.
Ammonii bromidi	3 "
Syr. tolutani	3 ounces. M

Teaspoonful every one, two, three, or four hours. This gives relief in a few minutes, and sometimes the relief is permanent.

CHILBLAINS. — The following formula for the relief of itching and irritation is recommended by Dr. Hildreth in the *Medical Brief*: —

Sulphurous acid	1 ounce.
Glycerine	1 ounce.
Distilled water	2 ounces.

Apply night and morning.

Another formula is given by Kilner: —

White wax	2 drachms.
Spermaceti	2 drachms.
Balsam Peru	1 drachm.
Olive oil	3 ounces.
Muriatic acid	2 drachms.
Water	6 drachms.

Make a plaster, and apply.

CONSTIPATION. — Where constipation is due to torpor of the muscular layer of the intestine, combined with defective secretion of the mucous membrane, Dr. Bartholow uses either one of these formulæ: —

Tinct. nucis vomicæ, Tinct. belladonnæ, Tinct. physostigmæ	āā f. ʒij.

Dose: thirty drops in water, morning and evening; or

Ex. physostigmæ, Ex. belladonnæ, Ex. nucis vomicæ	āā gr. v.

M. et ft. in pil No. x.

Dose: one pill at bed time.

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LOUISVILLE, KY., *April* 22, 1883.

THE formula of Richardson's CELERINA challenges the confidence fully of any one acquainted with its constituents. I have had occasion to prescribe it in numerous cases, and have found it to justify my expectations to a highly satisfactory degree. In nervous debility, or nervous exhaustion, especially from protracted overwork — in short, for almost any form of neurasthenia, it seems to me an invaluable remedy.

C. C. FORBES, M. D.,
Visiting Physician to the Female Medical, and the Obstetrical Department of the Louisville City Hospital; late Medical Superintendent of Central Kentucky Lunatic Asylum, Anchorage, Ky.

THE short, pithy sayings of great men pass into proverbs, and the short nib engrossing pens of Esterbrook's manufacture delight both heart and hand of rapid writers.

GOOD WORDS FROM SUBSCRIBERS.

I AM proud to say that I have been a subscriber to your JOURNAL for the past 12 years, and have always found it excellent in both quantity and quality. Long may it prosper

Yours respectfully, W. G. M. GEIPLE.

ALTHOUGH having so little bearing on my profession, there is no publication I have which I could so ill afford to give up as the JOURNAL OF CHEMISTRY, and none whose coming I so earnestly welcome. Truly yours, A. C. STILPHEN,
Attorney at Law.

I HAVE taken the JOURNAL for many years, and hope to take it many more, although I am eighty-seven years of age.

D. H. BISSELL.

HAVE taken the JOURNAL from the first number, and nowhere else have I received as much for the investment.

Yours truly, FERD. BROSHER, M. D.

I PRIZE the JOURNAL very much as an educator, and believe we ought to have more of such knowledge distributed through the country. Yours truly, J. E. STANLY.

AUGUSTA, MAINE

I HAVE taken the JOURNAL ever since the first number, and I do not want to be without it. I often find in it a single item worth more than the cost of the JOURNAL for one year.

Yours truly, H. H. HILL

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Familiar Science.

AIR BATHS.

ONE of the most sagacious, far-seeing men this country has produced was Doctor Franklin. He was in all that he did and said far in advance of his age and of his opportunities, and his wisdom was of that rare kind which does not grow old. His discoveries and devices were not partial and imperfect, but such as have needed little revision or improvement.

The lightning-rod he devised is to-day the best form we have, and his method of applying it to buildings needs no special modification. His open-fireplace stove is still largely in use, no better one having been devised. His philosophical theories and speculations were so rounded out, so clearly and sagaciously developed, that many of them stand to-day as fixed facts in philosophy and science. Among his important discoveries was the "air bath," a sanitary or curative agent which is of the highest consequence to the welfare of mankind. It may be said that he did not present the matter in much practical detail, but he suggested it, used it, and gave reasons for believing in its high importance.

We have made the air bath a matter of careful study, and wish to call the attention of the readers of the JOURNAL to it, as a means of securing and preserving health which is of the first importance. It is impossible for physicians or individuals of ordinary sagacity to fail to see that a large proportion of invalids and semi-invalids do not bear well the application of either cold or tepid water to the body. A man or woman must naturally be of strong constitution and in robust health to arise in the morning, in cold climates, and stand under the icy streams which come from a shower bath, without breaking down in health at an early day. The sponge bath is less injurious, but it saps the vitality of many to a fatal extent, and feeble persons are rarely in any degree benefited by its use. The tepid bath, as a curative means, constantly followed weakens rather than strengthens, and many cannot continue it for the space even of a week. Bathing, beyond the needs of perfect cleanliness, is not to be recommended to any one. Mankind are not aquatic animals, like ducks and geese; they are not born on or in the water, and nature never designed that they should be splashing about in that element within the lines of the temperate or frigid zones. Savage tribes, living under the equator, may be wet or dry, in the water or out; they wear but little clothing, and the temperature is uniformly high. Their habits accustom them to great changes in diet and exposure to winds and rains, and they manage to move along under the action of nature's inflexible law of the "survival of the fittest;" but they are in general short-lived.

Our "douching" and "wet-sheet" hygienic institutions have had their day. They did some good, but a great deal more mischief, during the time they were in favor. The "steaming and sweating" Turkish bath has been popular, but its evils have been so frequently demonstrated that it is rapidly falling into disuse. The strong and the healthy can survive all these extraordinary applications for considerable periods of time, but the weakly and the nervous usually grow worse under their continued employment.

With these brief allusions to the "water-cure" notions, which have had their "run," we now come to speak of a *better way* for physical and mental recuperation, in the case of those whose feebleness is congenital or due to disease.

The air bath is a means of recuperation which needs to be intelligently and carefully adopted, and like all other good things must not be abused. There are hundreds of thousands of people of both sexes, in this country, who lead miserable lives, and yet they are not in bed, not perhaps confined to their dwellings; they suffer from nervous prostration, from imperfect digestion and assimilation, from worry, from overwork, from the care of households, etc. A vast number in the mighty army of invalids are not themselves to blame for their physical weaknesses; their idiosyncrasies of organization come by inheritance. Heredity is the cause of one half of all the misery in the world.

Now, the air bath comes to the feeble and physically impoverished as a kind and good friend; and let us see how we can obtain from it the highest good. Nearly all semi-invalids are inclined to sedentary habits, and as the circulation is languid the body in winter is under a persistent chill. In the morning, upon getting out of bed, the clothing cannot be too quickly adjusted, as the body is in a shiver; and the air of a cool room is a thing to be dreaded.

The morning is the time for the air bath, and all that is required is a hair-cloth mitten and a moderately cool room. When the invalid steps from the bed to the floor in the morning, let the hair glove or mitten be seized, and without removing the night clothes proceed to rub gently all parts of the body, at the same time walking about in the room until a feeling of fatigue is experienced; then drop the glove, and gently pass the hand over all parts of the body before resuming the clothing. Unless the nude body is extremely sensitive to cold, a portion may be exposed to the air for a few moments while in motion, even on the first morning. The next morning jump out of bed in a moderately cool room, and go over the same process as before, remaining a little longer exposed to the air after the rubbing. The third morning repeat this treatment; and on the fourth, or at the end of a week, take off all the night clothing, and briskly apply the hair glove, first with the right hand and then with the left, all the time walking about. Follow up this, as the degree of strength permits, morning after morning, until the body is so rejuvenated and the blood so attracted to the surface, that the cool air is felt to be a luxury. Let the body be entirely nude, no socks upon the feet, no scarf about the chest. At first, or after the first week, perhaps, the exposure to the pure cool air may be three or four minutes; soon increase the exposure, until, after a month or two, the air bath may continue for twenty minutes or half an hour. Do not fail to walk about during the first month, using the hands in polishing the skin. After the first month the patient may sit in the air of the room part of the time, but constant, gentle exercise is best.

Now, another most important curative agent connected with the air bath is *sunlight*. In summer, sunlight is accessible, but in winter only the late risers can secure its benefits. If possible, sit and walk in the sunlight during the bath. It is astonishing what the direct actinic rays of the morning sun can do for an invalid, when the whole nude body is brought under its influence.

But this article is sufficiently long. Another will follow upon this subject in the next number of the JOURNAL, which will be of great value to all readers.

THE ANTIQUITY OF THE HUMAN SPECIES.

OUR abstracts of Dr. Winchell's Martha's Vineyard lectures have been received with so much favor by our readers that we are confident the following report of one of the last in the series will be equally welcome: —

At different periods the antiquity of man has been discussed from different points of view. Half a century ago it was thought the determination of the an-

tiquity of the oldest historic nations would settle the age of the human species. Then, the question of man's antiquity was supposed to hinge on the epoch of the prehistoric people of Europe. Now, finally, it appears that the age of man must be sought in the epoch of the black races of the southern hemisphere. As to the antiquity of the historic nations and the historic race, it is only necessary to state that Egypt appears to have established the oldest monarchy. The era of Menes, according to Lepsius, an original investigator of moderate views, was 3892 B. C.; though Bunsen put this era at 10,000 B. C., and Mariette and Lenormant at 5004 B. C. Other chronologers of repute bring it down considerably below the estimate of Lepsius. The determination of the latter may reasonably be adopted as most probable. It would thus appear that the first Egyptian monarchy dates from an epoch only 108 years after Adam, according to current biblical chronology.

But the Septuagint chronology gives us more time; and making due allowance for misinterpretations, we find no determination of secular chronology which conflicts with an allowable understanding of the sacred Scriptures. I assume, however, that our Scriptures undertake to give us only a history of the Adamic, or white, race. Those who hold that the inferior races are descended from the Adamic create the necessity of a vastly higher antiquity of Adam than can be deduced from the Bible.

We have next to consider the antiquity of the prehistoric people of Europe. The time has been when some maintained, and others feared, that they lived in an antiquity higher than the Bible allows, on the supposition that all mankind are descended from Adam. The scientific grounds of a belief in their remote antiquity are two: first, some preglacial remains of other animals were mistaken for human remains; second, some truly human remains were found in deposits erroneously supposed to be pre-glacial. These mistakes have been corrected, and it is now admitted that no relics of man in Europe are as yet known to date from an epoch anterior to the advent of the continental glaciers. This opinion has been formally enunciated by a resolution of the London Anthropological Society.

But it is generally admitted that European man appeared while glaciers covered half the continent. Not a few investigators maintain that this prehistoric man in Europe had an antiquity reaching as high as a hundred thousand years. What are the grounds of this opinion of the high remoteness of the glacial age? One of them is astronomical. Mr. James Croll has ingeniously argued that periodic glaciation of the northern hemisphere has been caused by periodic *maxima* in the eccentricity of the earth's orbit.

He concludes, therefore, that the decline of the last continental glaciers dates from eighty thousand years ago. This, then, would be the date of man's first advent in Europe. Another ground of the opinion is the fact that European man was the contemporary of animals now extinct. But it cannot be longer held that all geological extinctions belong to a remote age. Several New Zealand birds have become extinct since the arrival of the Maories. Some Madagascar birds have perished within three hundred years. The urus and the Arctic manatee have disappeared during historic times. So all feral species encroached upon by civilized occupations are receding, and are destined to extinction. Another ground of belief in the remoteness of the glacial epoch is the magnitude of the geological changes which have since taken place. The continental glaciers have disappeared; many feet of stalagmite have accumulated in caverns, and Great Britain has been twice joined to the Continent, and the bed of the North Sea laid bare.

But these great changes are only a little more important than some which have occurred within the scope of history and tradition. The Yellow River of China has twice changed its outlet over a distance of five hundred miles, and the intervening country has been devastated by a vast flood. The Black Sea has broken through the Thracian Bosphorus, and drained the famous Scythian plains. The Caspian has shrunken so as to lay bare thousands of square miles of ancient bottom. Such revolutions have occurred within three or four thousand years. We actually witness similar changes in progress. The Alpine glaciers continue to retreat at a measurable rate. The glacier stumps of the Sierra Nevada afford us an actual glimpse of the retreating forms of the continental glaciers of America. Many other great changes are in slow progress, which, in thousands of years, must transform the face of the earth. I feel justified, therefore, in accepting the conclusions of the best European archæologists, that, in spite of prehistoric man's contemporaneity with the continental glacier, the men of the reindeer period do not date back more than seven thousand years, nor the men of the rude stone epoch more than ten thousand years. But I find other grounds for the opinion that the Mongoloid race, to which they belonged, was in actual existence at a much remoter epoch.

Now, as to the antiquity of the human species at large, I have reason to believe that the black races antedated by thousands of years the Adamic, and even the Mongoloid race. This is shown by the admitted remoteness of complete racial differentiations, and by their wide dispersion over the earth before the posterity of Adam had penetrated into regions remote from the Adamic centre. It must be admitted also that the age of some human relics found in California seems to reach back to the Pliocene.

Some primitive brown-skinned type of humanity lived in the southern hemisphere in tertiary time. The Australians may be considered the nearest modern representative of it. Two ramifications took place. In one direction sprang into existence successively the Hottentots, the Papuans, and the negroes; in the other the Dravidians, who bifurcated into Mongoloids and Adamites. It would not be extravagant to assign a hundred thousand years for the antiquity of this primitive type of humanity.

"MINERAL" ORGANISMS.

During the past year the French chemists, D. Monnier and C. Vogt, presented, through M. Robin, to the French Academy of Sciences the results of some experiments, showing that the forms peculiar to plants and animals also appear under certain circumstances in purely inorganic things. Dr. H. D. Valin has repeated these experiments, and reports the results in the *Chicago Medical Journal and Examiner*: —

In a flask full of soluble glass were placed fragments of sulphate of iron, ten grains in weight, which immediately began to assume a colloid condition on the outside, and shot tubular prolongations, colloidal and cellular, which grew at the rate of half an inch in twenty-four hours. Some attained to two inches in length, and were about one twelfth of an inch in diameter. All these prolongations shot a number of slender filaments from various points of their surface, and these attained a length of a few inches in a few hours. After some days or weeks all these organisms assumed a crystalline condition, and became empty inside. Some of them rose to the surface of the liquid. They were insoluble in water, they remained intact when exposed to air, and when introduced into a newly prepared flask at the same time with fresh fragments they hastened the metamorphosis of these. The addition of water to the soluble glass rendered the experiments more easy, and saved time.

THORIUM.

Thorium is one of that large class of metals which are little else than curiosities of the laboratory or lecture-room, being found only in rare minerals, and obtained with extreme difficulty in a free state. Most of them are absolutely unknown in the arts, and it is hardly possible that they can ever prove of much industrial importance. On this point, however, it would be rash to speak positively, for certain rare metals, like iridium and uranium, have found their uses in these latter days.

Berzelius gave the name *thoria*, in 1815, to what he supposed to be a new earth, but which turned out to be a compound of yttrium. In 1828 he discovered a really new earth in a Norwegian mineral now known as thorite, and this was called *thoria*. It is an oxide of thorium, with the formula ThO_2. The metal has recently been studied carefully by Mr. L. T. Nilson, and the results (which differ in regard to the specific gravity and sundry other points from those in the manuals of chemistry) are thus given in foreign journals: —

Pure thorium was prepared by reducing potassiothoric chloride with dry sodium chloride and metallic sodium at a low red heat in a wrought-iron cylinder fitted with a piston to render it air-tight.

Thus prepared, thorium is a gray lustrous powder, which, examined under the microscope, is found to consist of thin six-sided lamellæ.

Thorium undergoes no change in the air even at a temperature of 100°C.–120°C. Heated to near redness, however, it burns with a very bright light to snow-white oxide. Burnt in chlorine gas, it likewise evolves light and heat, becoming converted into a white sublimable chloride.

Thorium is not affected by water or the hydrates of the alkalies. Treated with dilute sulphuric or nitric acid, a weak evolution of hydrogen takes place, the reaction being accelerated by heat. Concentrated sulphuric acid causes a very slow formation of sulphurous oxide. Dilute hydrochloric acid attacks the metal very readily, the fuming acid, as well as aqua regia, effecting its complete solution.

Thorium has a specific gravity of 10.99–11.01. It is tetravalent, and its atomic weight is 232.40.

NOURISHING FOODS AND DRINKS FOR THE SICK.

The following, from one of Miss Juliet Corson's articles in *Harper's Bazar*, will be found a valuable addition to the articles on diet for the sick which have from time to time appeared in the columns of the Journal: —

In cases of severe or prolonged sickness, when the disease taxes the system to such an extent that frequent and abundant nourishment is required to repair its ravages, the class of foods treated of in this article will be found useful. Although the diet should be nutritious, it must not be substantial; it must be easy of digestion and capable of quickly imparting its nutriment to the system. These requirements seem to be met by the semi-liquid foods, and since they can be used either hot or cold, and can be made stimulating as well as nourishing by the addition of a little wine, they can be so chosen as to meet the various conditions of debility, exhaustion, or fever. In administering these foods the fact should

be remembered that, unless there is some reason applying to the patient's welfare for using them cold, they will best serve the general purposes of nutrition when warm.

The basis of all caudles is flour gruel, made either with water or milk, that made with milk being the most nutritious, while both are equally digestible. In cool weather a quantity of gruel may be made and kept in a cool place, and portions of it heated and used as required. When gruel enters largely into the diet, its acceptability to the patient will be augmented by varying the flavoring or spice used in its preparation. If, therefore, a quantity is made plain, it can be sweetened and variously flavored as it is heated for immediate use.

Cold Wine Caudle (a nutritious, digestible, and slightly stimulating food, useful in all sickness where starch and wine are not objectionable). — Make a good gruel by mixing smoothly a tablespoonful of flour with half a pint of cold milk or water, and stirring it into a pint and a half of boiling milk or water; add a level teaspoonful of salt, and let the gruel boil for five minutes, stirring it to prevent burning.

To half a pint of cold gruel add one egg beaten to a froth, one glass of good wine, and sugar and nutmeg to suit the palate of the patient.

Hot Wine Caudle (preferable to cold caudle generally, and useful in the same physical condition indicated in the preceding recipe). — Heat half a pint of gruel; beat the yolk of a raw egg to a cream with two tablespoonfuls of pulverized sugar; beat the white of the egg to a stiff froth; when the gruel is boiling hot, quickly beat a glass of good sherry or madeira wine into the egg yolk and sugar, stir the hot gruel into it, and then add the beaten white of egg. Work very quickly, and serve the caudle hot.

Cream Caudle (an equally valuable food with the two preceding caudles, useful under similar physical conditions). — To one pint of gruel add one glass of good wine, one gill of sweet cream, one tablespoonful of noyau or any good cordial, and sugar to suit the patient's taste. Use hot or cold, but preferably hot.

In conditions of illness where an absolutely liquid food is better suited to the patient than that of semi-liquid character, milk, Irish or Iceland moss, and chocolate are valuable aliments; especially is this the case with any preparation of chocolate, which abounds in nutriment. In using these beverages, the facts should be borne in mind that excessively hot drinks lower the temperature of the body by inducing perspiration, while very cold ones are apt to check it so suddenly as to cause more or less congestion, sometimes of vital parts; moderately warm drinks are therefore to be preferred to either very hot or very cold ones. In feverish conditions, when there is a natural craving for cold drinks, the intense thirst can be safely assuaged by the frequent use of small bits of ice, which afford a sense of refreshment not to be obtained from large draughts of iced water, the immoderate use of which is never advisable, even in healthy conditions.

Almond Milk (an exceedingly nutritious beverage, useful in most conditions of illness). — Pour a quart of boiling water upon a quarter of a pound of shelled almonds, and when the skins soften rub them off the kernels with a clean towel; pound the almonds thus blanched in a mortar, putting in three or four at a time, and adding four or five drops of milk, as the almonds are being pounded, to prevent oiling, — about a tablespoonful of milk will be required for the quarter of a pound of almonds; when the almonds are finely pounded, mix them with a pint of milk, two tablespoonfuls of sugar, a level teaspoonful of salt, and the yellow rind of a lemon, and place the milk over the fire to boil; meantime beat three eggs smoothly, and strain the almond milk into them, stirring the mixture as the milk is strained in; return it to the saucepan, and place it in another pan of hot water, over the fire, stirring it constantly until it begins to thicken; then remove it at once from the fire, strain it, and use it.

Barley Milk (a demulcent, refreshing, and nutritious beverage, useful in fevers and gastric inflammation). — Wash four ounces of pearl barley in cold water until the water is clear; put it over the fire in a double kettle with a quart of milk and a level teaspoonful of salt, and boil it until the milk is reduced one half; then strain off the milk and sweeten it to suit the taste of the patient. The barley may be used as food by adding to it a glass of wine and a little sugar.

Irish Moss Water (a bland, nutritious drink, excellent in feverish conditions and in colds). — Wash half an ounce of moss in plenty of cold water, and soak it for ten minutes in a pint of cold water; then add two pints of cold water, a tablespoonful of sugar, and an inch of stick cinnamon to it, and boil it until it is about as thick as cream; strain it, add more sugar if it is desired, and use it while warm. The yellow rind of a lemon may replace the cinnamon as flavoring.

Icelandic Moss Chocolate (a very nutritious drink, suitable for use when abundant nourishment is required). — Wash one ounce of moss thoroughly in cold water; then put it over the fire to boil in one pint of water. Grate one ounce of chocolate fine, mix it with half a cupful of cold milk, stir it into a pint of boiling milk, and boil it for five minutes; then add it to the boiling moss, strain them together, sweeten them to suit the taste of the patient, and use the beverage warm.

SCIENTIFIC BREVITIES.

A Curious Experiment. — The ease with which persons fall under hallucinations of special sense is illustrated by M. Yung, in a recent communication to the Helvetic Society of Sciences. The operator places eight cards on a table, in positions corresponding to forehead, eyes, ears, nose, mouth, and chin; he pretends to "magnetize" them and also some person in the company, and then goes out, while the magnetized person is required to touch any one card. The operator, having returned, notes the action of a confederate, who scratches a part of his head corresponding to the card touched. Then he commences an innocent comedy, passing his hand carefully over the cards, and on reaching the touched card seeming to experience a strong shock. The observers are surprised, of course. One of them is then asked to go out and repeat the experiment. It is assumed that a certain card has been touched. Passing his hand over the cards, he indicates, in nine cases out of ten, a particular card as giving him a shock; and if the company be instructed to support his idea of that being the "correct card," he is confirmed in his illusion, which may be successfully repeated. Of 85 persons tried, M. Yung found only 9 who refused to indicate a card, not having experienced any sensation; 53 said they had exactly the sensation announced, and 23 described some different sensation.

The Bright Boy and the Rats. — An ingenious twelve-year-old boy, of Chester County, Pa., has devised a novel plan of getting rid of the rats which infest his father's cellar. He has constructed out of old fruit-jars a battery of three Leyden jars, which he connects, and places upon a large iron plate which touches the tinfoil on the outside. The bait is so arranged that, when the rat steps upon the plate and seizes the bait, he at once makes the connection between the outside and inside of the jars; and they are discharged through his body, killing him literally as quick as lightning. The boy charges the jars by means of an electrical machine, also constructed by himself. He ran a couple of wires through the floor to the cellar from the room above, and as soon as he would hear a rat squeak he would immediately re-charge the battery. The first time he put the machine in operation he slaughtered twenty-five rats in the space of three hours, and in two days the cellar was entirely cleared of the pests.

The Care of House-Plants. — Mr. Round puts the whole thing in a nutshell, thus: —

There are a few general principles touching the growing of house-plants which all successful window-gardeners must remember. They are as follows: —

(1.) Plants are a part of nature, and nature knows what is best for every variety; keep as close to nature as possible, for nature never makes a mistake.

(2.) Window-plants breathe, so they must have plenty of pure air.

(3.) Window-plants are great drinkers, so must have plenty of moisture.

(4.) Plants are subject to malaria, so that air poisoned with gases or water poisoned with impurities will make them sickly.

(5.) The skin of plants has pores similar to those of the human skin, so that the foliage must be kept clean in order to let the pores do their work.

(6.) Window-plants are as sensitive as children; they will not do well if neglected.

(7.) Plants get tired and after the effort to bloom always need rest.

If these few things are remembered, and common sense is exercised in some few others, the window-garden will become the pride and delight of the household, and carry a message of cheer to every stranger within the gates, and to every passer-by who takes a look at the windows.

Rupert's Drops. — Mr. J. Taylor, Science Master at Christ College, Brecon, sends the following note to the London *Chemical News*: It is stated in chemical text-books (for example, Roscoe and Schorlemmer's "Chemistry," vol. ii., Part I.; Miller's "Elements of Chemistry," Part II.) that Rupert's drops may be obtained by allowing molten glass to fall into cold water. I find that it is almost impossible to manufacture the drops in such a manner. I have used cylinders of different lengths, with water of various degrees of temperature, with the same result, the glass almost invariably breaking up into a number of small fragments directly it strikes the bottom of the cylinder. The drops may, however, be very easily obtained by using a saturated solution of ammonium chloride — freshly prepared with cold water (6° to 8° C.) — contained in a cylinder about eighteen inches long, the increased specific gravity and cold ensuring the almost complete cooling of the glass before it reaches the bottom of the cylinder.

The Climate of Palestine. — From its peculiar formation the country possesses much variety of climate. That of the hill country has been compared with the climate of Italy, while that of the Jordan valley is decidedly tropical. The rainy season usually commences towards the end of October, and lasts till March, after which the air clears, and for months the bright blue sky is unbroken by a single cloud. The annual rainfall is small, the average of seven years, during which observations have been taken, being only nineteen inches and a half.

The Methanometer. — This instrument, devised by M. Monnier, is an automatic indicator of the presence of "fire-damp." This gas, in contact with an excess of air, and under the influence of the induction spark or a red hot platinum wire, is decomposed into naphthalin, carbonic acid, and

water. From this decomposition there results a depression, which is transmitted in Monnier's apparatus to a manometer, the mercury of which, on reaching a certain level, sets up an electric current.

FROZEN PEOPLE. — It has been a mooted question what would be the best way to resuscitate those frozen. Laptschinski seems to have settled the question. Of twenty animals gradually brought to in a cold room, fourteen died; of twenty introduced at once into a warm room, eight died; of twenty placed immediately in a hot bath, all recovered.

THE SUNFLOWER AGAIN. — A writer in a London journal says: "There would, indeed, appear to be but few purposes to which the sunflower cannot be turned with advantage to mankind. Scientifically dealt with, it will supply us alike with our morning roll and our evening cigar. It is equally susceptible of conversion into a cake of soap, surpassingly emollient, or into a rich and lustrous silk dress. As oil it may be consumed no less freely in the salad-bowl than in the table-lamp. Cattle will fatten sooner on sunflower-cake than upon linseed-cake. The little busy bee improves each shining hour more profitably in connection with the girasol than with any other opening flower. In fact, so numerous are its excellences and so beneficial its virtues that the sunflower may with great propriety be designated the friend of man."

Practical Chemistry and the Arts.

THE USE OF CEMENTS.

IN an article on "Recipes and Formulæ," some years ago, we remarked, in substance, that accurate and valuable directions for industrial processes were often criticised or condemned by persons trying them, when the fault was solely in the manipulation. Either the directions were not carefully and exactly followed, or preliminary conditions essential to success were overlooked. This is specially true of cements, which almost always require care and skill in their use, in order to attain the best results, if not to avoid complete failure. If they are bunglingly or unskilfully applied, they often lose much of their adhesiveness, or "won't stick at all," as the experimenter declares in disgust. Of course he finds fault with the formula and the journal that has published it, when he should blame only his own clumsiness.

The following practical hints by M. Sibon, which we find in a foreign exchange, may save our friends from some of those vexatious mistakes in the use of cements: —

(1.) The surfaces to be united must be quite clean.

(2.) The less cement, wax, etc., that is interposed between them the better will they adhere. This is owing to the fact that with a thick layer the object has, at the junction, no more rigidity than that of the cement itself; as a rule, this is more fragile than the material it is employed to unite.

(3.) There should be perfect contact between the cement and the surfaces. With a view to securing this, the object must be first heated to a point such that the wax or cement cannot solidify without having first had time to effect a perfect union.

This remark is especially applicable when using sealing-wax, mixtures of resin, shellac, and similar materials. They will not adhere firmly unless the surfaces have been heated very nearly to the point of fusion to the cement. The sealing of letters offers an example in proof of this assertion. When the seal has been used several times in succession, or has been left too long on the wax, so as to become hot, it will adhere, and cause some inconvenience if further employed.

With hot melted glue adhesion is best secured by friction or a moderate pressure.

Sealing-wax is excellent for uniting metal to glass or stone, providing they are sufficiently heated to melt it; for, if applied to cold surfaces, it will not adhere at all. By heating two pieces of glass or stone ware sufficiently to melt shellac, a small quantity will suffice to make them adhere firmly together; notwithstanding that every one has seen such joints, very few succeed in making them, for the simple reason that they do not recognize the necessity of heating a delicate piece of glass or china to the point which is essential for securing a good result.

The principal obstacles to adhesion are air and dirt. The first is always present; the second is due to accident or carelessness. All surfaces are covered with a thin layer of air that is very difficult to remove; its influence prevents highly-polished metal from being moistened when immersed in water. So long as this layer of air is not displaced the cement cannot adhere to the surface to which it is applied, because it cannot come into direct contact. The most effective agent for displacing this air is heat. Metals heated to about 75° C. (170° F.) are immediately moistened on being plunged into water; hence it follows that, as regards cements that are applied in a fused state, heat is the best means of bringing them into intimate contact with the surface.

We would add that, in addition to possessing this advantage, the application of heat also renders the surfaces more penetrable to the layer of cement, after the manner of soldering, and makes the interlocking of the molecules more perfect. This explains the greater degree of tenacity of a well-made joint with only a thin layer of cement.

NAPHTHALENE.

HYDROGEN and carbon unite in a thousand different ways, forming compounds of all kinds and colors. Many of these compounds are liquid at ordinary temperatures, while others are solid, and not a few are of a gaseous nature. Some of them are odorless, others possess a delightful fragrance, and a few have an unpleasant smell. The oils of lemon and bergamot, of lavender and juniper, of cubebs and camphor, are all hydrocarbons of the same composition as the oil of turpentine. Kerosene, benzine, and gasoline are hydrocarbons found in crude petroleum. Illuminating gas is a mixture of hydrocarbons formed by the dry distillation of coal or wood.

Hydrocarbons differ greatly in the relative proportions existing between the carbon and the hydrogen. In some there are four atoms of hydrogen to one of carbon, in a few there are the same number of atoms of each, and in many there are more of carbon than of hydrogen. As the atom of carbon is twelve times as heavy as that of hydrogen, the proportion of carbon by weight is always much greater than that of hydrogen.

When hydrocarbons burn, the union between the carbon and hydrogen is first destroyed, and the combustion of the latter produces heat enough to render the free carbon luminous. When this heated carbon reaches the edge of the flame, it is also consumed with the formation of carbon dioxide. When the amount of carbon in the substance burned is very small, as in marsh gas (CH_4), the heat is so great that the carbon is soon consumed and the flame is non-luminous, like that of pure hydrogen. Olefiant gas (C_2H_4) contains more carbon, and produces a luminous flame. Only 6 per cent. of this gas is required to make a good illuminating gas. Substances like benzole (C_6H_6), which contain a still larger proportion of carbon, burn with a smoky flame. Even kerosene oil burns with a smoky flame unless the draught be increased by means of a chimney, so as to consume the excess of carbon. In the Bunsen burner, gas and air are mixed in such proportions that the carbon is consumed as fast as it is separated; a non-luminous flame, which deposits no soot, is the result.

People are prone to complain of the poor quality of their gas, but they should recollect that if the gas were a little too rich it would smoke and be an unbearable nuisance.

We have seen that carbon and hydrogen separate (are *dissociated*) by a high temperature, a law that holds good of all chemical compounds. A temperature which is not high enough to entirely decompose them breaks off some of the carbon, and the result is a substance less rich in carbon. Olefiant gas loses half of its carbon, and becomes converted into marsh gas. A form of carbon resembling graphite collects on the inside of gas retorts, if the temperature employed is too high. Hydrocarbon gases and vapors passed through hot tubes deposit carbon, either as graphite or lamp-black. The operation of making illuminating gas depends upon this same principle. Bituminous coal is a hydrocarbon excessively rich in carbon; by subjecting it to heat in large retorts other hydrocarbons, containing less carbon, are split off, leaving the rest of the carbon behind, in the form of coke. Too high a temperature gives off hydrocarbons of low illuminating power, because they are poor in carbon. Too low a temperature yields tar, benzole, and other condensable hydrocarbons too rich in carbon.

There is, however, another way in which heat may decompose a hydrocarbon. The substance experimented upon may be broken up into two other hydrocarbons, one rich in carbon, the other in hydrogen. The former is usually a solid, the latter a gas; but, what is more remarkable, the solid body very frequently has the composition $C_{10}H_8$. It is formed whenever naphtha is highly heated, and hence has received the name of *naphthalene*, or *naphthalin*.

Naphthalene was first noticed by Garden, and was first analyzed by Faraday in 1826. We are indebted for much of our knowledge of it to Laurent, who was more or less engaged in studying it for twenty years. It is a very abundant article, being found in the coal-tar of the old gas-works, and a troublesome by-product in the manufacture of the so-called "water gas." The latter, as we have frequently stated, consists chiefly of carbonic oxide and hydrogen gases. To render it luminous, it is passed over naphtha, which it carries with it in the form of vapor. It is next passed through hot retorts to "fix" this vapor. The fixing seems to consist in breaking up the naphtha into naphthalene and olefiant or other gases called *luminants*, because they render the gas luminous. The naphthalene deposits itself in the mains, the condensers, the purifying boxes, and other places, to the great annoyance of the workmen and to the loss of the gas company.

Pure naphthalene consists of white scaly crystals, that melt at 80° C. (176° F.), and sublimes without change. It has a peculiar odor and burning taste. It burns with a luminous sooty flame, and has therefore been employed in making lamp-black. Another use is in the albo-carbon burner already described in our columns.

Although naphthalene has not yet found uses that consume it in large quantities, it has several important applications on a smaller scale. One of the most important of these is founded on its antiseptic properties. It is said to kill fungi and bacteria very quickly, and is coming into use for surgical bandages, where it replaces iodoform, carbolic acid, and other bad-smelling substances. Naphthalene is not, however, devoid of all odor, although less objectionable in this respect than carbolic acid. As an insecticide it is also valuable, and will probably soon displace camphor for destroying moths in furniture and

entomological collections. It is insoluble in water, on which it floats; it is said to be non-poisonous; while it does not injure the skin, as carbolic acid does, unless largely diluted.

By the oxidation of naphthalene we obtain *phthalic acid*, from which in turn *fluorescene* and *eosine* are prepared. The last named is a delicate pink dye, that surpasses most of the aniline colors in beauty, and has been named from *Eos* (Greek), the dawn. Several other colors have also been made from naphthalene, of which the reds are best known.

Naphthol is another derivative of naphthalene, which is attracting some attention at present, and has been used with considerable success in skin diseases. H.

INDUSTRIAL MEMORANDA.

Incombustible Paper.— The *Chemiker Zeitung* gives the following modes of preparing incombustible writing and printing paper, which appear worth attention. The best asbestos is treated with a preparation of permanganate of potash, and then with sulphuric acid. Ninety-five per cent of this asbestos is mixed with five per cent. of wood pulp in water containing borax and glue. A fire-proof writing-ink is made by mixing Indian ink and gum with chloride of platinum and oil of lavender; for printing-ink, lampblack and varnish are to be substituted.

Matches with Sulphocyanates. — A new method of making matches has been invented in Europe. Instead of phosphorus, lead sulphocyanate mixed with precipitated antimony sulphide is treated in the moist state with an oxygenous substance, such as potassium chlorate, with indifferent coloring and rubbing agents, such as glass, quartz, pumice powder, ultramarine, etc., and with glutinous substances, such as glue, gum, and dextrin. The mixture is used in the place of the materials usually employed for making sulphur matches, wax-lights, etc.

Electricity and the Manufacture of Aniline Colors. — Mr. Goppelsroeder, a Swiss chemist, has exhibited at the Paris Exhibition aniline colors obtained by an electro-chemical process. The process rests chiefly on the decomposition of water, which, under the action of an electric current, gives free atoms of oxygen at the positive pole, and free atoms of hydrogen at the negative pole. The oxygen acts on substances such as aniline, toludine, etc., which, by oxidation or dehydrogenation, are changed into coloring matters.

Carne Seca. — This *carne seca* — dried or jerked beef — is exported to the amount of thousands of tons yearly from Montevideo, Rozario, and other parts of Uruguay and the Argentine Republic. In some of the *saladeros* or factories, over a thousand head of cattle are killed daily in the season, one man being usually the executioner of the lot, and killing them by puncturing the spinal cord at the back of the head. The animals are cut up, and the flesh piled in great heaps, with layers of salt, by semi-naked savages, half Basque, half Indian, who have a peculiar knack of causing the flesh to detach itself in flakes from the bone by giving it a slap with their broad cutlass-like knives. Wonderful quickness and dexterity are exhibited in every department of the process, but the whole forms one of the most disgusting spectacles imaginable. Mixed with black beans and *fariña*, or cassava-meal, jerked beef becomes the staple food of the lower orders throughout the coasts of South and Central America.

Exporting a Glacier. — The enormous mountain of ice, the Fonor-Svartisen, in Norway, is about to become, as we read in the *Revue Scientifique*, the object of a rather curious speculation. It appears that a company of merchants at Bergen have obtained the right to sell it, in blocks, for exportation. A number of blocks have been taken, and found of excellent quality, so that a number of vessels are being prepared for exporting it. As the glacier is about 120 miles square, and but two miles distant from the sea, it is probable the enterprise will prove very successful.

Paper from Bark. — Very good paper is manufactured in Naples, in a very primitive way, from the bark of a kind of daphne. The fresh bark is ground between stones into a very fine pulp, and as much as is required for a sheet is thrown into a cauldron containing boiler water. The pulp spreads in an equal layer over the water, and is then taken out.

New Test for Impurities in Chloroform.— According to Von Ivon, a solution of permanganate of potash is reduced by impure chloroform, but not by the pure article. A solution of 1 gram of permanganate of potash and 10 grams of alcoholic potash solution in 250 grams of water possesses a beautiful violet color, which at once turns green when impure chloroform is mixed with it. Von Ivon purified the chloroform by dissolving the permanganate in the least possible quantity of water, adding 20 grams of potash, and mixing this solution with the chloroform in a large flask, and shaking it from time to time. After a few hours it was decanted, and a fresh solution of permanganate added, and the operation repeated, until the latter retained its color for a few hours. The chloroform was then poured off, and dried with carbonate of potash, and finally distilled.

CHEMICAL NOTES.

Yellow Nitre. — The following analysis of "yellow nitre," found in the Atacama Desert, was made by M. Domeyko, a Chilian chemist: —

Sodium nitrate	42.80
Potassium nitrate	12 81
Potassium sulphate	4.59
Sodium chloride	16.63
Lithium chloride	0 12
Sodium iodate	4 95
Sodium chromate	0.90

The mineral is unequally distributed through ordinary white nitre. Heated in a tube closed at one end it gives off abundant vapors of iodine, of which it contains over 3 per cent.

Wanted, a Scientific Chemist. — The *Chemiker-Zeitung* quotes from a German journal devoted to the sugar industry an advertisement asking for the services of an "academically educated chemist, fully acquainted with the manufacture of sugar, who can undertake in summer the *coppersmith's work*, or the oversight of the *teams of draught oxen*."

Apropos of advertisements, the following appeared lately in one of our dental journals: "Wanted, Mechanical Dentist. Must be a practical man, competent to work *Gold*, *Platina*, *Celluloid*, etc. Students and recent graduates need not reply, as theory, Cicero, and Homer will not do. I want a *Practical Mechanical Dentist*, with common sense, and no appendages affixed to his name, *that knows how to work*."

Hard Soaps. — A neutral curd soap is made by Weineck's process, by melting the fat on a water-bath, and adding 20 per cent. of a soap solution to form an emulsion, which is then saponified with caustic soda lye. The saponification takes place very rapidly, and the under lye contains only glycerine and caustic soda.

A good soap can be made by saponifying equal parts of tallow and rosin with caustic soda of 30° B., and adding to the hot solution 2 per cent. of crystallized stearic acid, or 3 per cent. of stearine. It does not dry hard, like other rosin soaps.

A species of cactus is made useful in Florida. The strong fibre of its leaves is turned into rope, its juice into a pleasant beverage, and its trunk, after the removal of the pith, into pails.

Agriculture.

HOW NATURE SWEETENS OUR FRUITS.

The editor of the Journal gave a lecture before the Massachusetts Horticultural Society, at their rooms on Tremont Street, in this city, February 3d, on "The Sweet Principle of Fruits and Plants." A large audience was in attendance, embracing some of the most distinguished fruit-growers in the country, notably the venerable Marshall P. Wilder, President of the American Pomological Society. Extracts from a report of the address in the *Boston Transcript* are presented below: —

Dr. James R. Nichols delivered an address on "The Sweet Principle of Fruits and Plants." Substances characterized by sweetness are assumed to contain an organic product called sugar. This is a very remarkable substance, and its investigation opens to view surprises and paradoxes not afforded by any other agent in nature. It is highly complex in its organization, having a high atomic constitution, and yet it is the simplest of all compounds when considered in regard to the nature of the elements of which it is composed. In studying the sweet principle of plants, we soon discover that they possess the capability of elaborating more than one variety of sugar, and that there is a curious blending of several forms in the ripened fruits which come upon our tables. We discover also that each plant has the power of manufacturing a special variety, or a combination of varieties, and that this law of their constitution cannot be changed by man. In beet roots, in the stems and trunk of the sugar-maple tree, the sycamore, the palm, in sugar-canes, in the sorghum plant, in the stalk of maize, in grasses, we have one kind of sugar, called *sucrose*, which is the sweetest variety; in grapes we have another distinct variety, called *dextrose* or *glucose*; in apples and other fruits we have still another, called *fructose* or *levulose*. In melons we have a sweet which is nearly pure sucrose, or cane sugar. We learn from this examination not only that sugars differ widely, but that, for wise and doubtless beneficent reasons, the Supreme Intelligence has not permitted all fruits and plants to be sweetened alike. In that vegetable monstrosity called a beet, which is hidden from the clear sunlight and the air during the whole period of its growth, there are found juices which hold the most noble and valued form of sugar known to man. The crimson tissues of this root contain the snow-white sugar which graces the tables of the kings and princes of Continental Europe, and millions of pounds find their way into commerce, always commanding the highest prices. The humble, earthy beet can hold up its head with pride when its sweetness is contrasted with that of the petted grape, which occupies the foremost place among our delicious fruits. The grape is sweetened with glucose, an ignoble form of sugar, which the chemist can make in the laboratory, where its production does not require the employment of costly or rare materials. Even if it lessens our respect for the tempting fruit of the vine, the truth must be told. The chemist can make the sweet juices of the grape from old cotton rags and old newspapers; and if this statement does not indicate a sufficiently low origin, we have only to state that it can be made from common sawdust as well. But human art has not yet been able to number among its triumphs the production of the sugar of the beet, the maple, or the cane. It is probable that the peculiar delicate flavor of the grape could not be secured by any adjustment of quantity of sucrose or cane sugar, or by any mixtures. It requires glucose, pure and simple, to act in conjunction with the delicate acids, that we may have this fruit in its highest perfection

The water-melon would not be the fruit it is if it had not the capability of manufacturing cane sugar in large quantities; neither would the apple, the peach, the cherry, the strawberry, or the pear be what they are if the plants and trees upon which they grow had not the power of bringing into play a subtle chemistry, by which is produced a mixture of distinct forms of sweets which no art of man can imitate.

But Nature does not, in the bestowal of her fruits, spontaneously or of her own free will sweeten them for us so acceptably. Not one of the fruits in their wild or native state holds any considerable quantity of sugar of any kind, — not enough to make them acceptable to the taste or to fit them to serve as foods. It is only by skilful cultivation, by hybridizing, by budding and grafting, that we have secured the sweet principle in fruits. We have, as it were, educated the dumb chemists in the vegetable cell, and fitted them for the work which Nature made them competent to perform under man's guidance. The beet, for example, under ordinary care, will afford from four to six per cent. of sugar, but by scientific and generous culture the percentage can be nearly or quite doubled. The speaker has succeeded in increasing the sweet principle in apples, grapes, and peaches by cultivation and fertilization, and this when it was originally present in normal quantity. In increasing the sugar, we also increase every other desirable quality, for one principle cannot be forced into prominence without being accompanied by all the others.

Dr. Nichols here explained, with the aid of diagrams, the chemical constitution of sugar, starch, and cellulose, all of which are classed as carbohydrates. Cane sugar is a combination of water with carbon, — absolutely pure water with the elements of a diamond. Starch can be transformed into glucose by the addition of one molecule of water, but the glucose cannot be transformed into sucrose. A potato is but a mass of starch, which can be changed almost entirely into sugar. When starch is changed into sugar it requires the aid of diastase, which is a starch solvent, provided for a specific purpose. Sugar cane two weeks before it is ripe contains no sugar; after it is ripe it contains no starch. Sugar is not an exhaustive product; the refuse from the manufacture of beet sugar returns all inorganic matters to the soil.

But while it is possible to increase the saccharine principle, and also to modify the hydrated malic acid constituent in fruits, it is entirely beyond our power to change the fixed nature of vines or trees by any methods of cultivation or fertilization. There is nothing more wonderful in nature than the persistency with which vegetable structures adhere to their original bent or design. We all know that two trees growing side by side, from the same soil, breathing the same air, and precisely alike in external and internal substance, will produce fruit totally dissimilar in chemical constituents and physical appearance. If a young sour-apple tree is cut off low in its trunk, and scions of another kind are inserted, it is changed only above the point where they are placed. The chemical reactions below continue true to the original instinct, and if fruit comes from a sprout it is charged with the acid juices of the parent tree. We have thus the bewildering fact brought before us that the sap circulating through one portion of a tree culminates in the production of excess of acid in the fruit, while in another there is found an excess of sugar. It is not unusual to observe a newly set scion bud, blossom, and bear fruit the first year. The fruit may weigh ten times as much as the frail scion which held it up and supplied the nutriment necessary for its growth. But the little twig, transplanted to an alien limb, will set up a laboratory of its own, and from the strange juices brought to it will manufacture fruit totally dissimilar to its companion fruits, growing in close proximity. An example of this nature was afforded in the orchard of the speaker, when, from a scion having a surface for cell action of only nine square inches, a sweet apple was grown weighing seven ounces, and affording from its juices ninety-three grains of fruit sugar. Still more wonderful examples of fruit chemistry are shown in apples, which in their own structure exhibit sectional differences of composition, one half or one quarter being saccharine, and the other portions being extremely acid, and having the sectional lines distinctly drawn.

Dr. Nichols next gave some results of analysis of apples, with a view to ascertain their great value as food, from which it appears that in a bushel of ripe Hubbardston Nonsuches there is about six pounds of soluble nutritive material, in Tolman's Sweets about seven pounds, and in Baldwins about five pounds; and this material will vary to a considerable extent in value. These results agree with practical experience in feeding apples to animals. When fed in connection with meal they serve to give zest to the appetite, and to keep the animals in health. If cooked their value is much increased.

SEEDS.

THE time for procuring seeds for fields and gardens is close at hand, and we advise farmers and gardeners to be much more cautious in selecting seeds than usual. The seeds offered for sale the present year, owing to the drought, are, to a large extent, imperfect or worthless. We have examined some specimens of grass seeds which were destitute of the power of germination, and should be seized and confiscated. No farmer should be without a microscope of moderate power, as it is of great service in determining the value, not only of seeds, but many other objects connected with farms and households.

The weeds found on our farms come largely from the grass seeds, with which weed seeds are mixed. The microscope not only reveals to the eye the worthless seeds of the grasses, but by careful use it detects the weed seeds. Bad seeds are a source of great injury to farmers, and the subject should not be neglected.

BITTER MILK.

THE milk from our herd of cows at the farm took on a serious change in December, suddenly becoming bitter in taste, but retaining its usual physical appearance. The animals were in perfect health, and we could discover no reason for the change. The hay and grain were carefully examined, but nothing was found to awaken suspicion. The animals were successively fed from different mows of hay, which had been taken from widely different hay fields on the farm, but without success in influencing the milk. The meal and shorts indicated, physically or chemically, nothing which could produce the taste; and after exhausting all resources for discovery, the animals were allowed gradually to suspend the lacteal secretion.

Chemical examination of the milk afforded no clue to the problem; the rich cream was perfectly normal, with the exception of the bitter taste. We did not test it in butter-making, but feel certain that the butter would have been unfit for table use. This evil, we learn, has been widespread among cows, especially in the States of Maine and Vermont. We are inclined to think that it is due to some abnormal growths mixed with the hay, but not easily recognized.

An exceptional dry season, like the last, brings into life a class of weeds and grasses not usually found in our fields, and it is probable that some bitter herb of insignificant size is the cause of the mischief.

THE POTATO.

DR. HENDEE, of Callierville, Ala., in a letter to the JOURNAL, expresses his gratification at the distribution of the potato found to be indigenous in Arizona, and remarks as follows: —

Costa Rica, in Central America, is the native home of the Irish potato. The Spaniards found it there in daily use as food. The wild tubers were preferred, and they still are found in great abundance, not very large, but of exquisite flavor. The climate of the little state is pleasantly cool, the greater part of its territory consisting of a plateau 12,000 feet above the sea.

FRUIT CULTIVATION IN RUSSIA.

PROFESSOR BUDD, of Iowa, who is now travelling in Europe in the interests of horticulture, writes as follows to an Iowa journal concerning the famous fruit-city of Simbirsk, on the Volga, in Russia:

Simbirsk may be more properly named "The Orchard City" than any town we know of in Europe or America. Literally every available spot in and around the city is planted with apple, pear, cherry, and plum trees, all of which this year have produced great crops of really choice fruit. But not a single variety can be found that belongs to the races of fruit found even in North Germany. The climate is very trying, both summer and winter. The city is located in the dry steppe region, 500 miles east and a few miles south of Moscow. The air is very dry, and during the day excessively hot. On account of the rapid radiation, the nights, however, are decidedly cool, yet not too cool to prevent the ripening of tomatoes and first-class melons. The winters are colder than in any part of Minnesota; that is, the extreme winters, which come, as with us, at intervals of from six to eight years. In 1877, for instance, the temperature the last of December reached 50° F., with very little snow, while last winter was very moderate, with very heavy snows. Thousands of acres of orchard here are planted with a very few commercial varieties of the apple, which do not differ materially from those grown in the province of Kazan. The trees are small in size, and bushy in habit of growth, but loaded with very showy and excellent fruit. Could our friends at home drop in our hotel room at this moment they would see every stand and table loaded with very fine specimens of apples, pears, and plums. I wish to speak specially of the pears of Simbirsk. Many thousand trees are found growing under exceedingly varied circumstances. Some pear orchards slope to the east, and many to the south, west, and north. Some are on cultivated ground, the most are in stiff sod, and very many are found in yards and even planted in the public park. Under almost all circumstances they are loaded with fruit. But as a rule the fruit is not good. Ninety per cent. of the trees are seedlings of the Bergamot type, and the type and race known as Grucha. The true Ironclads have the leaf and habit of growth of the wild apples found native near the bluffs of the Upper Volga. The trees are low and scrubby in habit, but they are loaded with high-colored and really excellent fruit. With the quality of the apples here called good we have been surprised.

SIR JOHN LUBBOCK AND THE WASPS.

Sir John Lubbock continues his patient study of insect peculiarities, and has been giving some of the results in lectures which are reported in the English journals. The following is a sample of his work: —

As regards the industry of wasps, he timed a bee and a wasp, for each of which he provided a store of honey, and he found that the wasp began earlier in the morning (at four A. M.), and worked on later in the day. He did not, however, quote this as proving greater industry on the part of the wasp, as it might be that they are less sensitive to cold. This particular wasp began work at four in the morning, and went on without any rest or intermission till a quarter to eight in the evening, during which time she paid Sir John 116 visits.

The London *Agricultural Gazette*, after quoting the above, remarks: —

What a specimen of patient work! This is how knowledge grows. Darwin measured the growth of blades of hybrid growth and of pure uncrossed sorts for weeks together. He patiently observed the habits of worms, pulling waifs and strays into their holes, and compared the number of times they pulled them in sharp or blunt end first, for the light it might throw upon intelligence in the lowest creatures. Sir John Lubbock counts the visits of a bee and wasp for the determination of points in specific or individual character in a class somewhat higher. And it is by patient observation of detail that the greatest minds are content to labor in the accumulation of knowledge. Is there anything like this in our agricultural studies or investigations? We are content to lump our results, and make a shot at our conclusions; we act by rule of thumb, and laugh the weighing machine out of court altogether. The little paragraph about Sir John Lubbock contains, we submit, a useful lesson for agriculturists.

GLEANINGS.

Parsnips and Salsify for Winter Use. — Parsnips and salsify are perfectly frost proof. Indeed, they are better after they have been subjected to freezing. For winter use it is a good plan to take up a supply for the family or for market before the ground freezes up, and cover with plenty of sand or sandy loam. They can be put in boxes, with sand in sufficient quantities to last while the ground is frozen. There are no vegetables more palatable in the winter than an occasional mess of parsnips and salsify. In early spring, when other vegetables are scarce, they come in just at the right time.

Farm Book-Keeping. — The careful keeping of farm accounts is an important matter, but there is truth in the following remarks from the London *Agricultural Gazette:* All the transactions upon a farm are complicated. Only general results can really be determined. The most ingenious book-keeping ever invented, or to be invented, can never do more than be one of several methods of ascertaining whether farming does or does not pay. It is quite certain that neither book-keeping nor reading, useful as both may be to stimulate the mind, can ever take the place of that readiness to deal with incidents as they arise, that faculty of organization, which really are the qualities which separate successful from unsuccessful farmers.

Fraudulent Hops. — It is reported that, owing to the high price of hops, some enterprising parties in England are buying up the spent hops used by the ale-brewers, and, after drying and manipulating them, exporting them to the continent of Europe. A writer in the *Pharmaceutische Zeitung* remarks that this is probably meant as a "return-dedication" for the artificially colored rose-leaves which some German dealers put on the London market two years ago.

Boston Journal of Chemistry.

Jas. R. Nichols, M. D., *Editor.*
Wm. J. Rolfe, A. M., *Associate Editor.*

BOSTON MARCH 1, 1883.

THE JOURNAL.

Austin P. Nichols, B. S., has become connected with the Journal as proprietor and associate editor. Mr. Nichols is the son of Dr. Nichols, the founder and editor of the paper, a graduate in chemistry of Harvard University, and he brings to the work of conducting the Journal desirable and valuable qualifications.

It is probable that some important changes will be made at an early date, by which the Journal will be greatly improved and its usefulness extended.

It will remain in charge of the editors so long associated with it, and the same familiar, instructive methods of imparting useful information will be continued. Its popularity was never greater, nor its field of usefulness wider, than at the present time.

"LECTURESHIP" SCIENCE.

The gentleman who astonishes the clergymen of Boston and vicinity by his outpour of knowledge and "cataract" of eloquence, every Monday morning, in Tremont Temple, is supposed to be familiar with all branches and details of all the sciences, physical and metaphysical, natural and unnatural. Where or how he obtained this enormous fund of scientific knowledge is as great a puzzle as to know how it can all be photographed on or diffused through the contents of a single skull. He appears as the representative and interpreter of the army of scientific gentlemen, not only in Europe, but in Asia and Australia. He is capable of putting before his audiences the "advanced thoughts" of the *savants* of the world, even in "advance" of the thinkers themselves. Here we have phenomena worthy of investigation.

OSTRICH FARMING.

Considerable interest is manifested in some parts of the country in the new industry of ostrich farming. It is proposed to occupy vast areas of the Western and Southwestern States with an army of ostriches, which are to be cultivated for the valuable feathers which they furnish. So much enthusiasm has been awakened in the business that the eggs of the bird sell at enormous prices; and this reminds us of a story told by a friend who long resided in South America, in the Argentine Republic, the home of the ostrich. He was called, at one time, far down the coast, and travelled across the vast plains where are found their feeding and breeding fields. The number within view constantly was very great, looking in the distance, drawn up as they were in long lines, like a vast army in line of battle. Their eggs are dropped upon the warm sand, and so great was the number that it was difficult to ride among them on horseback without crushing them constantly. At a lonely Spanish fort on the coast he met an English naturalist, who had just landed, and who expressed a strong desire to obtain a few eggs for his museum.

He was told that it might be possible to secure a few, perhaps a dozen, and was requested to come inland to the camp of the gentleman the next day, where he would endeavor to have a few collected for him. With the view of producing an amusing surprise, the servants were ordered to collect several thousand of the eggs, and pile them up in the form of a pyramid behind the encampment, there to await the arrival of the naturalist. He came, and was invited in the morning to look at the pile of eggs which he was expected to take with him to England. The surprise was indeed amusing, but he begged leave to decline the generous gift which had been presented to him. Ostrich eggs in some parts of South America have a low market value.

OVERWORK IN FEMALE SCHOOLS.

In an article in the Journal, last April, we took the ground that worry is more injurious to the pupils in our schools than work, and that girls suffer from this far more seriously than boys, being more ambitious, more conscientious, more sensitive in regard to rank, and more "nervous" about all their school duties and relations. We also expressed the opinion that much of the school machinery is directly adapted to increase this nervous tension in the pupil; and that the daily "marks" for recitations, the frequent written examinations, the annual "promotions" depending upon marks and examinations, all tend to keep the scholar in a state of chronic excitement and anxiety which is a severe strain on the nervous system. At the time, the article was copied into several of our leading educational journals and many other papers, and, so far as we are aware, its statements and arguments were unanimously endorsed and approved.

A recent discussion on "female brain-work," at a medical meeting in England, shows that similar views are coming to prevail there. Some physicians announced themselves as the "champions of health and ignorance for women," but the general opinion appeared to be that health might be secured without the penalty of ignorance, if educational methods were what they should be. Dr. Tuke is reported to have spoken as follows: —

No doubt a certain number of young women suffered and broke down whilst studying, but this did not necessarily imply that study was the cause of the break-down. Idleness and ignorance were much more prolific causes of disease amongst women than overwork. They were the main producers of hysteria and all sorts of vaporish complaints, of many ills and evils, and of inanity, if not of insanity. As a matter of fact, it was not an easy thing to overtask the energies of the brain by work. It was not work, but worry, that killed the brain. The latter, he feared, must be ever with us all. The most highly educated and hard-working women whom he had the honor of knowing were eminently healthy. Perhaps this might be the "survival of the fittest;" but, even granting that it was so, the more women worked the more fit women they would have. The break-down from overstrain did occasionally take place, and the first really important symptom was sleeplessness; when that set in, there was cause for alarm. As soon as a child or young person developed continuous headache, work should be discontinued.

WORDS OF APPROVAL.

OCCASIONALLY we venture to publish extracts from some of the letters received at the office from warm friends among our family of readers. It may indeed be said that *all* our readers are warm friends of the JOURNAL; of this we have abundant evidence. A lady of great intelligence, writing from Somerville, N. J., under date of February 12th, says, "Before closing I wish to say a word regarding the JOURNAL. It has become one of the papers in our home which are welcomed with delight. It is welcomed as *Harper's Weekly* is, by young and old alike."

Another old subscriber, under the same date, writes as follows: "My interest in the JOURNAL is constantly *increasing*. The articles published upon Comets and Meteors, the Transit of Venus, Man in the Light of Geology, Chemistry of Life and Death, are exceedingly interesting, and such as I put away to consult often."

Every mail brings letters of like import, and they are grateful and full of encouragement.

TREES IN STREETS FROM A SANITARY POINT OF VIEW.

AN interesting controversy on the utility of trees in streets and open spaces in cities has been lately going on in the Geneva journals. It arose out of a discussion in the International Hygienic Congress, which was held in Geneva in August, and Dr. Piachaud, a member of the Congress, has since contended, in the *Journal de Genève*, that trees in streets do more harm than good; that they impede the circulation of air; and that, as for the shade they afford, people who do not like sunshine have only to keep on the shady side of the street. Instead of planting more trees in towns, as some propose, he would rather, in the interests of hygiene, remove all existing trees. In reply, Professor Goret, of the University, points out that the functions of trees in streets are not limited to acting as screens for sun-shunning wayfarers; they temper the heat, and serve as a protection against dust. The evaporation from their leaves tends to keep the surrounding air cool and moist. One of the best means of refreshing the air of a sick-chamber is to place in it plants and branches, and sprinkle them with water. A like effect is produced by trees. Sunlight is necessary to health; but trees, if not too thickly planted, do not intercept sunlight; the perpetual vibration of their leaves and swaying of their branches admit the light every instant, and in sufficient measure, and serve, moreover, to protect the eyes from the noonday glare. So far from trees impeding the circulation of air, they help to purify the air; the evaporation from their leaves determines a current from above, and the fresh air thus brought down helps to drive away the heated and dust-impregnated gases of the streets. Another useful property of foliage is that, while in hot, dry weather it moistens the surrounding atmosphere, thereby rendering it fitter to breathe, this effect, which is due to evaporation, ceases in wet weather. Trees, moreover, act as purifying agents by absorbing carbonic acid and giving out oxygen. But the action of trees on the air is far less important than their action on the soil. Their roots draw up stagnant waters, and absorb the organic matters contained in the filth from which the streets of a town are never free, and which, after infiltrating the ground, are a frequent cause of fevers and infection. Trees, in fact, have the same effect on the sub-soil of towns as fields have on the contents of their sewers, — they act as disinfectants. Taking these facts into consideration, Professor Goret ventures to differ from the conclusions of the Hygienic Congress, and strongly recommends the planting of trees in streets and squares. But they must be planted with judgment. They should be placed at proper distances apart, and the branches should not be allowed to come in contact with the buildings near which they grow. The sorts best adapted for street planting are those which grow to a considerable height and spread out their branches. The fashion that prevails in some Continental cities of cutting trees down to a uniform size is highly objectionable. The branches of trees so treated become so compacted together as to be impervious to light, and the shade they give, although deep, is too circumscribed to be of much use.

DARWIN'S RELIGIOUS VIEWS.

DURING the meeting of German scientists and physicians, held last year in Eisenach, Professor Ernst Haeckel lectured on the natural religion of Darwin, Goethe, and Lamarck. In the course of this lecture he made the following remarks: —

That Darwin also held to the same natural religion as Goethe, and that he was no adherent of any special church confession, is apparent to any one reading carefully his works. But as some of his countrypeople have, since his death, asserted the contrary, and as some clergymen have praised Darwin as an adherent of a special confession of the English church, I am able to introduce here an exceedingly valuable but hitherto unknown document, which will remove every doubt that might possibly exist.

A young German student, whose faith in the Christian religion had been shaken by the perusal of Darwin's work, and who had entered the intermediate stage of doubt, wrote to Darwin, for the purpose of getting the advice of this eminent natural philosopher. At first, one of the relatives of Darwin answered by excusing the latter's ill-health, great age, and want of time, which prevented him from answering the questions put to him; but the German student was not satisfied, and so he once more wrote to Darwin, begging him to help him in his dilemma. He then received the following letter, written and signed by Darwin himself: —

"DOWN, *June* 5, 1879.

"*Dear Sir*, — I am very busy, an old man, and in bad health, and I cannot gain the time to perfectly answer your questions, supposing that they may be so answered. Science has nothing to do with *Christ*, excepting in so far as the habit of scientific exploration makes a man cautious in recognizing proofs. As far as concerns myself, I do not believe that there has ever taken place any revelation. But regarding a future life, everybody has to decide for himself between contradicting uncertain probabilities.

"Wishing you future welfare, I remain, dear sir,

"Very respectfully yours,

"CHARLES DARWIN."

GROWTH OF GERMAN UNIVERSITIES.

THE following table shows the number of students matriculated in the universities of the German Empire in 1882, as compared with the number in the same schools in 1872, with the gain for ten years. One only shows a loss, namely, Münster. The enormous increase noticed at Strasburg is due to the accession of Alsace to Germany since the Franco-German war, as well as the disordered state of that province in 1872: —

	1872.	1882.	Gain.
Berlin	1990	3900	96 per cent.
Leipsic	2315	3111	34 "
Munich	1220	2017	65 "
Breslau	897	1532	71 "
Tübingen	872	1400	61 "
Halle	985	1377	40 "
Würzburg	759	1091	44 "
Göttingen	871	1083	24 "
Bonn	750	1061	41 "
Heidelberg	841	922	10 "
Königsberg	549	863	57 "
Strasburg	212	823	288 "
Marburg	375	766	104 "
Freiburg	231	721	212 "
Greifswald	250	659	27 "
Erlangen	359	575	60 "
Jena	423	570	35 "
Giessen	290	435	50 "
Kiel	152	381	151 "
Münster	371	326 decrease	14 "
Rostock	137	217	58 "
Total	15,119	23,830	58 "

It will be observed that the universities are arranged in the order of their size, Berlin heading the list. Vienna competes with Berlin for the largest number of students in Europe. At times Leipsic also exceeds Berlin.

METEOROLOGY FOR JANUARY, 1883, ETC.

THE sum of my observations on the weather for the past month, with further statistics in summary, has been as follows: —

Average Thermometer.		Lowest.	Highest.	Range
At 7 A. M.	16.45°	—2°	40°	42°
At 2 P. M.	26.94°	9°	46°	37°
At 9 P. M.	20.58°	3°	38°	35°
Whole month	21.32°	—2°	46°	48°
Second average	21.14°	—2°	46°	48°
Last 20 Januaries	22.72°	12.48°	32.98°	20.40°
		In 1867.	In 1880.	
Second average	22.42°	12.44°	32.65°	20.21°

The average barometer for the month has been 30.058 inches; the lowest, 29.60, on the 21st, and the highest, 30.36, on the 16th, a range of .76 of an inch. The average for the last 11 Januaries has been 29.968; the lowest, 29.840, in 1879, the highest, 30.080, in 1880. In 4 of the 11 Januaries it has ranged above 30 inches, while the yearly average for the last 10 years has been 29.965 inches. The sum of the daily variations was 8.15 inches, giving a mean daily movement of .263 of an inch. The average for the last 11 Januaries was .287, with extremes of .196 and .391, in 1881 and 1882. The largest daily movements were .52 and .69 of an inch, on the 18th and 21st, in close connection with two inches of snow and the largest rainfall of the month.

The face of the sky in 93 observations gave 44 fair, 7 cloudy, 25 overcast, 7 rainy, and 10 snowy. The amount of rainfall, including twelve inches of melted snow, was 3.40 inches, while the average amount for the past 15 years has been 3.94 inches; the lowest amount was 1.8, in 1871, and the highest 7.55, in 1878.

The direction of the wind in 93 observations gave 9 N., 2 S., 0 E., 27 W., 8 N. E., 32 N. W., 1 S. E., and 14 S. W., or an excess of 32 northerly and 64 westerly over the southerly and easterly, indicating the prevailing direction to be approximately

west 26° 30′ north, a large W. N. W. The average for the past 14 Januaries has been west 19° 35′ north. The westerly winds have uniformly prevailed over the easterly by an average of 53.4 observations, and the northerly over the southerly, with one exception in 1870, by an average excess of 19 observations. The relative progressive distance for January, 1883, was 71.51; that is, if each observation be counted as a unit, the net relative progress of the wind would be 71.51 such units. In other words, if a balloon were to start on the first day of the month, and travel one mile or one league during each observation, in the direction noted, it would land on the last day of the month 71.51 miles or leagues from the starting-point, and in the direction W. 26° 30′ N. from that point.

The past January was more severely cold than usual, being 1.4° below the average of the past 20 Januaries, and 3.25° colder than the past ten. The 23d was the coldest day, the three observations being —2°, 9°, and 3°, an average of 3⅓°. The 31st was the warmest day, with an average of 38°. From the 21st to the 23d was a sudden change from the warmest noon to the coldest, during the month. Good sleighing was enjoyed 19 days, from the 10th to the 28th. The amount of snow was small; but this, in connection with repeated rains, was mostly converted into ice.

BAROMETRIC VARIATIONS THE PAST TEN YEARS, FROM 1873 TO 1883.

Month.	Average 10 Years.	Lowest Year.	Highest Year.	Range.	Lowest Observation.	Highest Observation.	Range.	Av. Daily Movement.	Extremes.	
Jan...	29.965	29.840	30.080	.240	29.05	30.57	1.52	.390	.391	.196
Feb'y	29.910	29.430	30.138	.108	28.84	30.74	1.90	.363	.383	.162
Mar.	29.885	29.623	29.991	.368	29.00	30.55	1.55	.360	.364	.207
April.	29.793	29.598	29.900	.308	29.00	30.42	1.42	.374	.339	.189
May.	29.936	29.888	30.001	.133	29.42	30.38	0.96	.125	.170	.013
June.	29.904	29.846	29.957	.112	29.44	30.20	0.76	.115	.218	.038
July.	29.919	29.891	29.957	.066	29.49	30.22	0.73	.089	.118	.061
Aug.	29.957	29.868	30.010	.142	29.60	30.26	0.66	.068	.114	.051
Sept.	30.017	29.915	30.141	.226	29.18	30.38	1.20	.119	.196	.074
Oct..	29.977	29.898	30.091	.193	29.30	30.40	1.10	.163	.211	.113
Nov..	29.978	29.815	30.193	.378	28.70	30.52	1.82	.243	.315	.127
Dec..	29.942	29.804	30.073	.269	28.94	30.60	1.66	.255	.327	.190
Av...	29.931	29.776	30.044	.218	29.16	30.44	1.27	.188	.251	.121
Max.	30.017	29.915	30.193	.378	29.60	30.74	1.90	.390	.391	.207
Min..	29.798	29.430	29.900	.066	28.70	30.20	0.66	.068	.114	.051
Ran..	.224	.485	.293	.312	.90	.54	1.24	.307	.277	.156

From the above table we may discover some general principles, and especially that the three gentle summer months show the smallest daily movement, while the three winter months show the greatest, unless we except December, which is slightly exceeded by March, as we might expect. The three autumn months average the highest, while the two spring months, March and April, average the lowest. The highest observation during the ten years was 30.74 inches in February, 1876, and the lowest 28.70, in November, 1873, a range of 2.04 inches. If such change were to occur at once, it would be equivalent to removing the pressure of a ton from a medium-sized person. Other comparisons of interest may be discovered by a study of the above table.

D. W.

NATICK, *February* 8, 1883.

EDITORIAL NOTES.

A NOVEL QUESTION IN LIFE INSURANCE. — A curious question concerning life insurance has arisen in England, giving a grimly humorous termination to the famous Lamson case. It seems that the murderer had an insurance of £1000, payable to his widow. Immediately after his execution claim was entered for its payment. The company objected on the ground that the assured had died neither from natural causes, disease, nor unavoidable accident. The estate claimed, however, that, though the death was a violent one, it was in no sense a suicide, which would have annulled the policy. The assured had certainly not voluntarily delivered himself to the executioner; on the contrary, it could be maintained that he had yielded only with reluctance. The company paid the claim under a formal protest. It will be interesting to see how the case comes out. Some of our American companies have ceased to make death by suicide an exception to the insurable methods of shuffling off this mortal coil; and competition may yet lead them to advertise "policies non-forfeitable on account of legal execution."

THE BOLD WATER-DRINKER. — The *Boston Medical and Surgical Journal* of February 1st says: A curious wager is now being decided in Philadelphia, which is not without medical interest. The Schuylkill River, which supplies the drinking-water to the greater portion of the city, has lately been quite low, and covered with ice; as a result the water has had a bad taste and odor, and by most persons it is regarded as unwholesome. To test it a physician is said to have offered fifty dollars as a prize for any one who would have the temerity to drink a quart of it for ten days in succession. This offer has been accepted, and at a variety entertainment in the upper portion of the city, each evening, the doomed man comes on the stage, the stipulated amount of water is brought in, and he takes his draughts to slow music before a sympathetic audience. Although he hastens to neutralize it with sundry alcoholic mixtures, it is not believed that he can hold out to the end, for it is the agreement that if he vomits or dies he will lose the prize.

THE HARVARD VETERINARY SCHOOL. — The *Springfield Republican* says: Harvard issues a prospectus for a veterinary school, to open this year. It is to give a three years' course of instruction, and has a considerable staff of professors, among them Dr. Charles P. Lyman, very favorably known in this city. The prospectus bears the seal of the college, with its inscription, *Christo et ecclesiæ*, — "for Christ and the church"! If Harvard can introduce Christianity into the horse business, disbelief in miracles will be at an end.

PATENT MEDICINES FOR THE PREMIER. — A London exchange says: Mr. Gladstone's illness has been marked by the usual influx of offerings of patent medicines. The post-bag has been loaded with a miscellaneous collection of bottles of liquids, boxes of pills, packets of lozenges, and pots of ointment. In most instances the gift is accompanied by many interesting particulars of a certain illness which befell the writer, and how he (or she) took this medicine and was cured. Mr. Gladstone's recent local affection being stated to have been lumbago, embrocations in abundance have been received at Hawarden Castle.

A NEW ORDER OF EARRINGS. — According to the London *Court Journal*, the institution of bronze earrings, with "Merit" engraved on them, is said to be contemplated by the authorities. These ornaments are to be given to female nurses who have distinguished themselves in hospital service during war.

MR. SETH C. BASSETT, formerly United States Mail Agent, has taken charge of the advertising and subscription departments of the JOURNAL. He is a courteous gentleman, an efficient business man, and we with pleasure introduce him to our business patrons.

ATOMS.

ANILINE dyes are now made fast, in cloth, by sending a current of electricity through it from one plate to the other, the two plates being connected to the two poles of a voltaic battery.

DR. GROUSSIN, of Paris, has described a case which puzzled him much. His patient was a wealthy lady, and her disease simulated apoplexy. By accident he discovered that she got drunk regularly four times a week on eau de Botot. Wine, Chartreuse, or Cognac would have revealed the secret through her breath, but the eau de Botot enabled her to pass unsuspected.

MADRID has received the title of the classic home of consumption. It is said that last year 1000 persons died there from this disease alone. The frequent sudden and violent changes of temperature cause a host of pulmonary complaints, while the number of victims to the zymotic diseases seems to show that the city is no better drained than it should be.

THE little canary seed, which we feed to our birds only, is used by the natives of the Canary Islands as an article of domestic food. It contains a large proportion of nutritious farina.

ONE of the industries of Australia is the cooking and canning of rabbits, which are so plentiful in some districts that whole crops are sometimes destroyed by them. One firm during the last season, which lasted twenty-five weeks, canned six hundred and seventy-five thousand of the animals.

A WIDOW named Callahan is the largest sheep owner in Texas. Her flocks number more than 50,000 head. Her ranges are in Uvalde and Bandera counties, in the southwestern part of the State. The sheep, a cross between the hardy Mexican variety and the Vermont merino, are divided into flocks of two thousand head each, with a "bossero" and two "pastoras" in charge of each flock.

AT a medical examination, a young aspirant for a physician's diploma was asked, "When does mortification ensue?" "When you propose and are rejected," was the reply.

LITERARY NOTES.

WE have received *A New Theory of the Origin of Species*, by Benjamin G. Ferris. (Fowler & Wells, New York, $1.50.) The author puts forward a new and original theory in regard to the origin of the various forms of life upon the globe. While he accepts evolution in a general sense, he holds that it will not entirely account for the immense difference between the species, and claims that they must have originated by an *extraordinary generation* from the nearest allied species. Thus, for instance, at some remote period an ape must, by virtue of a special act of creation, have produced a human being, — of a low type, probably, but still a human being, — which, by the well-known principles of the evolutionary theory, developed into the man of the present day. Mr. Ferris claims that these "extraordinary generations" are due to a "fresh influx of life direct from the Creator," and in this way seeks to reconcile the teachings of science with the doctrine of an overruling Providence. But, until he can bring forward more facts in proof of his theory than he has shown in this work, we must consider it as merely a theory, with very little, if any, evidence to sustain it.

House Drainage and Sanitary Plumbing, by William P. Gerhard, of Newport, R. I., an essay which we have before noticed, is now published in book form by D. Van Nostrand, New York, at the low price of fifty cents. The author is an expert in this class of work, and the book will be invaluable to any one about to build or to make alterations in plumbing fixtures.

We have received from Messrs Houghton, Mifflin & Co. the January number of the *U. S. Official Postal Guide*. It is a complete compendium of all matters relating to the postal service, and is indispensable to all who make use of the mails. A supplementary number is issued monthly, giving all the latest changes in post offices, postal laws, etc. Price of the January number, $1 00 (in cloth, 50 cents extra); for the year, $1.50.

The Harpers have recently published *A History of Ancient Art*, by Dr. Franz von Reber, director of the royal galleries of paintings in Bavaria, and professor in the University of Munich, revised by the author, and translated, with additions, by Mr. Joseph T. Clark. It is an octavo of about 500 pages, with 310 illustrations on wood ($3.50). Its accuracy and its value for the student and general reader are vouched for by Prof. Charles Eliot Norton, than whom there could not be a more competent or more fastidious critic. In an introductory note to the volume, he says, "So far as I am aware, there is no compend of information on the subject in any language so trustworthy and so judicious as this. It serves equally well as an introduction to the study and as a treatise to which the advanced student may refer with advantage to refresh his knowledge of the outlines of any part of the field." Such an indorsement from such a man could not be emphasized by any comments of ours.

We have also received *Scrofula, and its Gland Diseases*, by Frederick Treves, F. R. C. S., published by Henry C. Lea's Son & Co., Philadelphia (10 cents), and the *Fourth Annual Report of the State Board of Health of Illinois*.

Medicine and Pharmacy.

MINOR DYSPEPSIA.

THIS is the subject of an interesting paper read by Dr. W. R. D. Blackwood before the Philadelphia County Medical Society, January 10, 1883, and printed in the *Medical Times*. The causes of the ailment he specifies as bad cooking, hurried "bolting" of food at table, imperfect digestion in the stomach (through impaired function), and defective duodenal digestion. After dwelling at length on each of these, and remarking that "in all forms of indigestion prevention is better than cure," he proceeds to consider the treatment to be adopted. The indiscriminate use of bitters, cordials, and the like is condemned as "indefensible on rational grounds." Most of the artificially prepared pepsins and pancreatines are pronounced worthless. Bismuth "has been blindly handled, especially in combination with pepsin, whose action it neutralizes." What follows seems to us worth quoting in full: —

The nitro-muriatic and phosphoric acids are much better, and, if urgent need prevails, the administration of a soda or potassa salt for a short time will do much more service than either the subnitrate or the subcarbonate of bismuth. In all forms of dyspepsia strychnia or nux vomica is extremely valuable; and where acidity or constipation is present, very small doses of belladonna, with at times cascara sagrada, will remove the difficulty.

Regular exercise, especially equestrianism, is very efficient in atonic conditions, and, where this cannot be had, walking, together with abdominal massage, is good. General faradization of the abdomen is an admirable method of toning up the peristaltic action, particularly in constipated patients; whilst galvanism is unusually efficient in hepatic torpor, and static electricity in my hands has acted promptly, thoroughly, and permanently in relieving the dyspepsia so common in nervous, hysterical school-girls Where liver congestion exists to a decided degree, the employment of mercurials, such as calomel, blue mass, or hydrarg. cum creta, is better avoided, because of their blood-defibrinizing quality, and recourse should be had to one or more of the efficient agents long used by the eclectic fraternity, and lately investigated in a series of exhaustive experiments by Rutherford and others. Of these, podophyllin, irisin, and euonymin are the most valuable; but I am in the habit of combining them with very felicitous results, and at the risk of being criticised I annex a favorite formula, used for many years; and it is, I may say, the only one approaching the so-called "shot-gun" prescription which I ever use, my habit otherwise being to order simply one ingredient, or at the most, and that rarely, three, in any one recipe: —

Cinchonidiæ sulphatis,	
Euonymin.,	
Irisin.,	
Leptandrin.,	
Juglandin.	ää 3ss.
Podophyllin,	
Ext. belladonnæ,	
Ext. nucis vomicæ,	
Ext. hyoscyami	ää gr. x.

M. In pil. no 60 div.

Sig. One or two at bed-time.

Many a stubborn case of dyspepsia, that had run the gauntlet unavailingly of all sorts of peptonoids, has given way to this, and it is an admirable cholagogue on general principles. In scrofulous subjects, with deficient nutrition, I have had much benefit from minute doses of mercuric bichloride (the one hundredth of a grain) in tinct. calumbæ comp., the dose being a drachm of the latter thrice daily. Within a few weeks a most interesting case, treated by several physicians for organic cardiac lesion, has recovered under the remedies just alluded to. The palpitation, the supposed dilatation with compensating hypertrophy according to canonical dicta, has subsided; the patient can lie down, and sleep too when recumbent; he has no night tremor or dread; he can run up-stairs or after a car; he can eat, drink, and be merry now, whereas before he was morose, taciturn, and a family nuisance; in short, he has dropped a minor dyspepsia, and with it a prognosed incurable heart-trouble. Dyspepsia, like charity, covers a multitude of troubles and sins, and a good deal of the "malaria" so fashionable with the fraternity, and with the laity also, is one or another form of indigestion.

CHILBLAINS.

AMONG the minor ailments to which our flesh is heir few are more vexatious than chilblains, and few are more obstinate. Remedies without number have been suggested, but we know of none that are to be depended upon in all cases. A recent number of *New Remedies* gave a list of between forty and fifty formulæ, and as many more could easily be found in the back numbers of medical journals. A correspondent in New York State favors us with a prescription of his own, which he says has never failed in his experience. It is simply a solution of thirty grains of permanganate of potassa in an ounce of pure water, to be applied thoroughly with brush or swab, or in the form of a poultice. We give it for what it may be worth. If it prove the desired specific for the complaint, we shall rejoice at having been the means of bringing it before the long-suffering public of chilblain victims. We ask no reward except that each of them will celebrate his cure by sending us a new subscriber for the JOURNAL. It may easily double our circulation.

MUSHROOMS, RAW AND COOKED.

DR. C. L. DANA, professor of physiology in the Woman's Medical College of the New York Infirmary, sends us a note in criticism of the views of Professor Ponfick, of Breslau, as quoted in the JOURNAL for December, page 143. He says: —

Now, I know plenty of persons who like raw mushrooms, and have eaten *a quart of them in a day* even, without harm. I have eaten them raw myself. So far as I can learn — and I have made some inquiries — raw mushrooms are not only harmless, but easily digestible.

This is one of the matters on which "doctors disagree," — perhaps because some of the harmless species of mushroom are at times noxious. On this subject Dr. Horace T. Evans, in a recent paper, says: —

The *Agaricus campestris pilei*, though the safest and best of the class for the table, are yet at times objectionable, owing to the irritation and pain following their consumption. When gathered too early or too late, or when growing in a too moist soil, they will often manifest their innate noxious tendency. Hence the propriety of our ever consenting to their employment as food becomes very doubtful. As a rule, the skilled cultivator can detect the poisonous variety, but the fact that even the innoxious at certain times and under certain circumstances become poisonous (Reese's "Toxicology") shows that even the expert cannot at all times guarantee immunity to the consumer. The absence of the pink or purple color in the gills of the fungi should at once condemn them as certainly poisonous.

He considers, however, that mushrooms may sometimes be more dangerous when cooked than when raw: —

In the usual process of cooking (namely, incomplete boiling, and the utilizing of the fluid in which they are cooked as a constituent of the dressing or dip), the poison becomes more active than when they are eaten in the uncooked state.

The safest manner of preparing the mushrooms for the table is to soak them for several hours in strong salt water, then rinse them in fresh water, and boil them rapidly for a short time; again remove them from the water, and cook them in milk and whatever *etceteras* the taste may dictate.

In the discussion which followed the reading of Dr. Evans's paper in Philadelphia, other facts were given showing that the condition of the weather may influence the character of the fungus. In some localities the farmers pen up their hogs for a few days after a heavy rainfall, following a prolonged drought, knowing that if the animals are allowed to run at large many will be poisoned by the mushrooms which spring up from the wet ground, while those fungi which grow during ordinary weather are not hurtful.

It is also of the utmost importance that mushrooms should be fresh when eaten. They should be gathered as soon as possible after their growth, and used as soon as possible after gathering.

Dr. Evans, in closing the discussion, said that he believed that all mushrooms contained the poisonous principle, but not always in sufficient quantity to do harm. The difference between the safe and the unsafe was one of degree only.

AN ASEPTIC CHAMBER.

THE impossibility of excluding dust and germs from the air of the laboratory, and the extreme difficulty of ensuring their absence even from smaller chambers or bell glasses, has always thrown a doubt on the results of researches into the life history of bacteria and other micro-organisms. After three years' patient labor, Dr. Adrian Schücking, of Pyrmont, has succeeded in constructing a chamber which not only shall be absolutely dust and germ free, but shall permit of ingress and egress without contamination from the outer air. There are many other investigations in which it may be employed, but it will be an indispensable adjunct to the physiological laboratory. The *London Medical Times and Gazette* gives the following description of this "aseptic chamber:"—

It consists of two chambers, the walls, floors, and roofs of which are covered with well-soldered zinc-plates or sheets of glass. The door of the ante-chamber and that between it and the inner chamber are made air-tight with india rubber, and both compartments are lighted by glass windows closely sealed. The distinguishing feature of Dr. Schücking's chamber is the ventilation. The air is drawn out by an exhauster (Scheer and Petzold's) worked by an engine of half a horse power. This is connected by tubes with the outer chamber, and, performing 2500 revolutions per minute, extracts thirty cubic meters, or the entire contents of the ante-chamber, in that time. The inlets are ten in all —

three in the inner room, four in the outer, and three in the wall which parts them. They are forty centimeters square, and formed of clean compressed cotton-wool, about ten centimeters thick, securely fastened into a leaden frame, and covered by a thin sheet of felt. Before any observations are commenced, the walls are washed down with a five per cent. solution of carbolic acid, and the whole chamber disinfected by bromine vapor. The air is then exhausted. Between the opening of the outer and inner doors a full minute must be allowed for the renewal of the air, and the removal of any germs that may have been admitted from without. The outer chamber serves also, in prolonged experiments, for the reception of food or excreta, and is also furnished with a bath. The experimenter, or patient to be experimented on, should be clad in linen, with an outer garment of india-rubber, both previously disinfected. If desired, the walls of the antechamber might be further purified by a spray apparatus each time the door is opened.

COTTON-SEED OIL IN PHARMACY.

Mr. S. S. Bradford, in the *Journal of Pharmacy*, has the following practical notes on some of the uses of cotton-seed oil in pharmacy, and the means of detecting it when mixed with olive oil: —

Having had occasion, during the last six years, to manufacture lead plaster in considerable quantities, it occurred to me that cotton-seed oil might be used instead of olive oil, at less expense and with as good results. The making of this plaster with cotton-seed oil has been questioned, as according to some authorities the product is not of good consistence, and is apt to be soft, sticky, and dark-colored; but in my experience such is not the case. If the U. S. P. process is followed in making this plaster, substituting for the olive oil cotton-seed oil, and instead of one half pint of boiling water one and one half pint are added, the product obtained will be equally as good as that from olive oil. My results with this oil in making lead plaster led me to try it in making the different liniments of the Pharmacopœia, with the following results: —

Linimentum Ammoniæ. — This liniment, made with cotton-seed oil, is of much better consistency than when made with olive oil. It is not so thick, will pour easily out of the bottle, and if the ammonia used is of proper strength will make a perfect liniment.

Linimentum Calcis. — Cotton-seed oil is not at all adapted to making this liniment. It does not readily saponify, separates quickly, and it is almost impossible to unite when separated.

Linimentum Camphoræ. — Cotton-seed oil is far superior to olive oil in making this liniment, it being a much better solvent of camphor. It has not that disagreeable odor so commonly found in the liniment.

Linimentum Chloroformi. — Cotton-seed oil being very soluble in chloroform, the liniment made with it leaves nothing to be desired.

Linimentum Plumbi Subacetatis. — When liq. plumbi subacet. is mixed with cotton-seed oil and allowed to stand for some time, the oil assumes a reddish color, similar to that of freshly made tincture of myrrh. When the liquor is mixed with olive oil, if the oil be pure, no such change takes place. Noticing this change, it occurred to me that this would be a simple and easy way to detect cotton-seed oil when mixed with olive oil. This change usually takes place after standing from twelve to twenty-four hours. It is easily detected in mixtures containing five per cent. or even less of the oil, and I am convinced, after making numerous experiments with different oils, that it is peculiar to cotton-seed oil.

ATROPIA FOR EARACHE.

One of the most painful ills that childhood is heir to is ear-ache, and what druggist has not been besought by the worn parent for something that will "cure the ear-ache." Probably there is no better remedy, when skilfully applied, than a leech, — either a live leech or the artificial leech. Warm oils and laudanum sometimes give relief, but their use is not unattended with danger. Dr. A. D. Williams recommends the use of atropia. Of course, such a powerful remedy must also be used with care, and by a skilful nurse. He says: "What physician has not been puzzled to know what to do for the constantly recurring ear-aches of children at night? The most effectual treatment, and the one that had stood the test of years, is the local application of a solution of the sulphate of atropia. Not a single case but has yielded at once. The solution is to be simply dropped into the painful ear, and allowed to remain there from ten to fifteen minutes. Then it is made to run out by turning the head over, then being wiped with a dry rag. The solution may be warmed to prevent shock. From three to five drops should be used at a time. The strength of the solution must vary according to the age of the child. Under three years one grain to the ounce, and over ten years four grains to the ounce of water. In adults almost any strength may be used. All ages will bear a stronger solution in the ear than in the eye. The application should be repeated as often as may be necessary. Usually, a few applications will stop the pain. In acute suppurative inflammation of the middle ear and acute inflammation of the external meatus, atropia will only slightly palliate the suffering, but in the recurring nocturnal earaches of children it is practically a specific."

MISCELLANEA MEDICA.

A New Anæsthetic Agent. — It was found by M. Bert that anæsthesia could be produced with a mixture of nitric protoxide (85 vol.) and oxygen (15 vol.), if the application were made in a metallic enclosure with a certain pressure above the atmospheric. M. de St. Martin has obtained the same effect *at ordinary* pressure by adding a small quantity of chloroform to the mixture (6 or 7 grams per hectoliter). The physiological effects seem to be intermediate between those of nitric protoxide and of chloroform. Anæsthesia is very rapidly produced, and the period of excitation which occurs with chloroform is avoided. The superiority of nitric protoxide is taken advantage of, but without pressure being necessary. The protoxide alone, it may be mentioned, produces anæsthesia rapidly, but also gradually asphyxia.

The Results of Koch's Discoveries in Germany. — Dr. Formad, in a letter to the *Philadelphia Medical Times*, states that, by a German imperial order, in military hospitals phthisical patients are separated from other cases as carefully as small-pox patients; so a gentleman tells me who has just come from Germany. Even here the community begins to regard the disease as eminently contagious. I know of an instance of a young woman suffering from phthisis being locked up and avoided, perhaps neglected, by the members of her own family, for fear of the contagium. I have learned of several consumptives who have become worse from the mortification of having their friends avoid them, some even going so far as not to shake hands with them. The moral effects must certainly be most deleterious to these unfortunate creatures and to those who surround them.

Trichinæ in Adipose Tissue. — It has been generally assumed that trichinæ occur only in the muscular substance, and are not found in the fatty tissue. Chatin's latest investigations have, however, shown that trichinæ occur uniformly in the latter, where the parasites are free or only loosely connected with the neighboring tissue elements. Their nature may readily be mistaken, but is shown by the simultaneous occurrence of encapsuled trichinæ in the muscular tissue. Experiments proved that animals fed with trichinous fat exhibited no indications of trichinosis, while others fed with the flesh from the same infected animal quickly suffered and died with symptoms of intestinal trichinosis; although further observations on the comparative innocuity of the fat must be made before the fact can be regarded as of hygienic importance. The practical value of the discovery at present seems to be that the fat, as well as the flesh, of suspected animals should be examined.

A Dangerous Toothache Cure. — A formula frequently used to relieve toothache is the following: —

Spts. chloroformi,	
" æth. sulph.,	
" camph.,	
Tr. opii,	
" iodinii	ää f℥i.

A pledget of cotton saturated with this mixture is placed in the hollow of the aching tooth. It was tried once by Dr. Charles H. Miller, of Peabody, Kansas, who reports the case in the *Southern Clinic*, in a stout young girl of eighteen, who used the remedy several times, and finally went into a stupor, from which it took many hours of hard work to arouse her. He therefore cautions against prescribing it too liberally or too carelessly, especially where the patient will be left in entire and undisputed possession.

"Double Chloride of Gold" without any Gold in it. — A "cure for drunkenness," sold under the name of "double chloride of gold," is said to have the following composition: —

Chloride of ammonium . . .	1 grain.
Aloin	2 grains.
Compound tincture of cinchona .	3 fluid ozs.
Water enough to make . . .	4 " "

This new *aurum potabile* is not likely to be dangerous, whether it cures the alcoholic habit or not; but the self-reforming inebriate may reasonably object to paying a golden price for it.

Sulphur and Malaria. — At a recent meeting of the Paris Academy, M. d'Abbadie called attention to some facts regarding marsh fever. Some African elephant hunters, from plateaus with comparatively cool climate, brave the hottest and most deleterious Ethiopian regions with impunity, which they attribute to their habit of daily fumigation of the naked body with sulphur. It is interesting to know whether sulphurous emanations, received involuntarily, have a like effect. From inquiries made by M. Fouque, it appears that in Sicily, while most of the sulphur mines are in high districts and free from malaria, a few are at a low level, where intermittent fever prevails. In the latter districts, while the population of the neighboring villages is attacked by fever in the proportion of ninety per cent., the workmen in the sulphur mines suffer much less, not more than eight or nine per cent. being attacked. Some other facts tending to show the anti-malarial influence of sulphur are given.

The *New York Medical Record*, commenting on the above, says: "It will be a great comfort for some to know that, though the bottomless pit is feverish, there can be no real malaria."

Treatment of Sequelæ of Frost-Bite. — The *Philadelphia Reporter* observes that Dr. Lapatin, of Tiflis, communicated to the Caucasian Medical Society his discovery of an effectual means for the relief of a very annoying sequela of the milder degrees of frost-bite, in the form of pains and a very annoying prickling sensation in the parts, which for years come on, especially in the colder seasons

and on sudden changes of weather. After trying all the remedies which had been recommended, he found that the best was an old one called "Rust's frozen wash," consisting of equal parts of dilute nitric acid and peppermint water. With this the parts are brushed over once or twice a day, preferably by means of a glass brush. After three or four applications the skin assumes a brown color and becomes dry, and a superficial scab forms, which when thrown off leaves a healthy skin. Within one and a half or two weeks the sensations, which frequently prevent the soldiers from putting their boots on, disappear forever. The writer in the *Reporter*, however, states that he knows a far better, quicker, and more reliable remedy, which never fails if mortification has not set in, namely, balsam of copaiba. This is spread thickly on a piece of muslin or linen, and the affected parts covered with it during the night, a stocking being put over the whole. In the day some of the balsam is merely spread over the parts. After one or two applications the redness and pains all cease, and a few more not only remove every residue, but seem to impart a remarkably increased vital resistance to the parts against frost-bite, if only common precautions be used. The writer has long considered this remedy an unfailing specific.

BENZOATE OF SODA IN WHOOPING-COUGH. — Tordeus, of Brussels, prescribed benzoate of soda in a number of cases of whooping-cough, and in all cases the coughing-fits began to diminish in force and frequency after one or two days of treatment. He gives four grains of the salt every hour to a child two to three years old.

SELECT FORMULÆ.

SALICYLIC HAIR TONIC. — A correspondent of the *Druggists' Circular* recommends the following as the best remedy against dandruff, itching of the scalp, and falling of the hair: —

Borate of soda	10 drachms.
Salicylic acid	10 scruples.
Tincture of cantharides	6 ounces
Bay rum	25 "
Rose water	25 "
Boiling water, enough to make	4 1-2 pints.

Dissolve the borax and the acid in boiling water; mix the bay rum and rose water with the solution; then add the rest, and filter.

COUGH MEDICINE. — The *Indiana Pharmacist* says that the following makes a very good preparation for bronchial irritations, coughs, and colds: —

Tincture tolu	2 ounces.
Good rye whiskey	6 pints.
Water	1 pint.
Fluid extract bloodroot	2 drachms.
Rock candy	2 pounds.

Dissolve the rock candy by heating with the water; add the whiskey, tolu, and bloodroot; then strain through a muslin.

GUAIAC FOR THE CUTTING SHORT OF ACUTE TONSILLITIS. — Dr. Morell Mackenzie says that guaiac given early will rarely fail to cut short an acute tonsillitis. The formula is as follows: —

Resin guaiac	70 gram.
Gum tragacanth	43 gram.
Sacchar. alb.	17 gram.
Black currant paste	q. s.

M. Div. in trochischi No. 350. Sig.: One every two hours.

One can also give aconite, as recommended by Ringer. If the disease is not checked, give small pellets of ice.

SYRUP ORANGE PEEL, FRESH. — Mr. E. H. Hollister gives this formula in the *Pharmacist*: —

Fresh orange peel	℥ ii.
Alcohol	℥ ii.
Aqua pura, q. s. to percolate	℥ ix.
Sugar	℥ xiv.

Cut the peel in small pieces; put in mortar and add the alcohol; thoroughly bruise to a pulp; put in a glass percolator; add the aqua pura until nine ounces have percolated; put the sugar in percolator, and percolate the menstruum through the sugar until dissolved.

TOOTH WASH. — The following is from the *Proceedings of the California Pharmaceutical Society*: —

Fine ground white oak bark	2½ ounces.
" " rhatany root	½ ounce.
" " sassafras bark	1 drachm.
" " cinchona (red)	3 drachms.
" " cardamom seeds	30 grains.
" " Ceylon cinnamon	20 "
" " cloves	30 "
Oil of wintergreen	1 fl. drachm.
" anise	½ "
Alcohol	20 fl. ounces.
Water	12 "

Macerate ten days, filter. Finished product, 1¾ pints.

TO PULVERIZE MUSK. — A French pharmaceutical journal says that this vexatious operation may be easily accomplished thus: Take musk, 1 part, alcohol at 95°, 4 parts; syrup, 30 parts; and distilled water, 100 parts. Triturate the musk with the alcohol in a marble mortar into an impalpable powder, which is done in two or three minutes, and add the water gradually, and then the syrup. A mixture is thus produced like all those holding medicinal powders in suspension, such as bismuth, etc.; but musk, owing to its slight density, is much more easily held in suspension than these bodies, and does not require the addition of gum as they do. A slight shaking diffuses the musk, which requires several hours to get to the bottom of the bottle again.

IMPERMEABLE COURT PLASTER. — A kind of court plaster, bearing the name *Emplastrum impermeabile Russicum*, has been of late introduced into the market, which exhibits a white enamelled skin, made adhesive on one side by a layer of isinglass.

The skin removed from the latter was found to consist of a mixture of collodium, zinc oxide, and castor oil.

This impermeable court plaster may be made by mixing collodium with sufficient castor oil to render it elastic when dry, the oil having been previously rubbed up with some zinc oxide. By dipping glass plates into this mass, and allowing the film formed to dry on them, and then re-dipping and re-drying two or three times, a film of suitable consistency would be obtained. This, painted over with a strong solution of isinglass and dried would complete the operation.

FACETIÆ.

ANECDOTE OF LISFRANC. — Some fifty years ago, modes of operating for cataract were not so numerous as at present, there being only four, — depression, extraction, reclination, and breaking-up. One day an old lady came to Lisfranc's clinic, suffering from cataract, and who had a habit of mispronouncing technical terms. Lisfranc, having examined her eyes, said, "My good lady, you have been operated upon twice, you say; can you tell me what procedures were adopted?" "Certainly I can: Dupuytren operated upon me by *amusement*, and Roux by *distraction*." "Oh, then," added Lisfranc, "since amusement and distraction have done nothing for you, I will proceed to operate upon you by *inclination*."

THE SPORTING DOCTOR. — Dr. X. (as the French say) enjoys an occasional day with his gun. Returning one evening, he remarked disconsolately to his assistant that he had been about all day, and had killed nothing. "That 's very unusual for you," naively answered the sympathetic assistant.

"THERE are two boating associations here," wrote a Japanese student home, "called Yale and Harvard. When it rains, the members read books."

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L. K. EVANS

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MY wife and children find a great deal of interesting and valuable reading in the JOURNAL, as well as myself, so we think we cannot drop it from our list. Yours truly,

W. W. ARNOLD

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